Comprehensive Analysis of Clinical Features and Prognostic Laboratory Findings of COVID-19 Patients based on Age Groups in a tertiary care teaching hospital in Telangana, India

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Abstract

Background

Clinical and laboratory findings are important to increase the success rate in the management of COVID-19 patients.

Objective

In the present study, we defined the age specific symptoms of COVID-19 that can help in diagnosis of COVID-19 on hospital admission.

Materials and Methods

Patients who visited OPD of MNR Medical College and Hospital, Telangana with suspected COVID-19 symptoms and tested with SARS-CoV-2 Real-Time RT – PCR test between April 20 – June 20, 2021, were included in our study. Symptoms on admission, demographic data, hospitalization and prognostic laboratory tests were documented.

Results

Out of 5100 admissions, 612 (12%) patients had confirmed or suspected COVID-19. Patients were sorted according to age groups to determine the difference in demographic data, symptoms, co-morbidities, prognostic laboratory findings and outcome. The exposure history was lower in the 65-79 year age group, contrary to the ≥ 80 year age group. Sore throat, headache, myalgia, loss of of smell and taste were specific to the 18-49 year age group ($p<0.001$). Shortness of breath was higher in the 65-79 and the ≥ 80 year age group than the 18-49 year age group. Comorbid diseases, hospitalization, prognostic laboratory tests (lymphopenia, C-reactive protein (CRP), D-dimer, ferritin) were found significantly higher in the ≥ 65 year age group than the 18-49 year age group.

Conclusion

Our study determines the symptoms, comorbidities, prognostic laboratory findings and outcomes between different age-grouped patients referred to our OPD with confirmed or suspected COVID-19. We found that comorbidities, hospitalization and poor prognostic factors were more common in patients over 65 years. Predominant symptoms and prognostic laboratory findings vary in different age groups, which help the physicians differentiate the disease in clinical practice. Personalised criteria are to be formulated based on different age groups which may help in early screening and diagnosis of COViD-19. Comprehensive analysis of clinical and laboratory findings to identify COVID patients with severe prognosis is important for follow up of patients and also to identify the pathophysiology of the disease.

Keywords

Clinical features, prognosis, COVID-19, SARS-CoV-2, age groups.

Introduction

Coronavirus disease-2019 (COVID-19) is an acute respiratory disease caused by severe acute respiratory syndrome Coronavirus 2 (SARS-CoV-2) . It has caused an explosive catastrophic pandemic that affected almost all parts of the world and produced significant loss of lives and the worst financial crisis recorded ever since World War II. The World Health Organization (WHO) declared COVID-19 as a a pandemic on March 11, 2020. There were 250,333,159 cases and 4,333,094 deaths worldwide till August 15, 2021 (1,2).

COViD-19 manifests by a broad spectrum of symptoms from asymptomatic to severe illness that can cause death of patients. The most common symptoms of COVID-19 at hospital admission are cough, fever, myalgia, loss of smell and taste, shortness of breath and fatigue (4-9). Some patients have additional symptoms like headache, nausea, vomiting and diarrhea. Presently, there are few studies regarding COVID-19 symptoms defined by specific age groups (10).

It will be a dilemma to differentiate COVID-19 patients from other respiratory tract infections with symptoms on hospital admission. However, if specific age-related symptoms may be demonstrated, it becomes easier to diagnose these patients at hospital admission.

In the present study, our aim was to determine the symptoms of COVID-19 and define age-specific symptoms and prognostic laboratory tests, which may be helpful to diagnose the disease on hospital admission.

Materials and Methods

This is a retrospective, cross-sectional study, which included patients who visited OPD of MNR Medical College and Hospital, Telangana with suspected COVID-19 symptoms between April 20 – June 20, 2021. Patients 18 years and older who were tested for SARS-CoV-2 Real-time RT-PCR were included in the Study. Medical records were examined and data collection forms were filled. Demographic data regarding the gender and age of the patient, information regarding contact with suspected /confirmed COVID-19 patients (exposure history), comorbidities, smoking status, symptoms on admission (fever, sore throat, cough, headache, fatigue, myalgia, loss of taste and smell, difficulty in breathing, chest pain, nausea, vomiting, diarrhea), laboratory tests [total blood count, C-reactive protein (CRP), D-dimer,

ferritin, troponin, procalcitonin and real-time polymerase chain reaction (RT-PCR)], imaging characteristics and hospitalization were documented.

Statistical Analysis

Statistical analysis was performed using the 15.0 version of the Statistical Package for the Social Sciences (SPSS) program. Age groups were defined as follows: 18-49 years, 50-64 years, 65-79 years and ≥ 80 years (12). Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated using univariate logistic regression to measure the association between age groups and sex, comorbidities, symptoms, exposure history, prognostic factors and hospitalization of COVID-19 patients. Multivariate logistic regression analysis was used to determine the factor affecting treatment, hospitalization and intensive care unit (ICU) admission. Independent variables with p values < 0.05

in the univariate analysis [age, sex and presence of comorbidity, diabetes mellitus (DM), chronic lung disease, chronic heart disease] were included in the multivariate model.

Results

During the study period, a total of 5100 admissions were reported. The number of suspected or confirmed COVID-19 patients was 612 (12%). Out of 612 patients, 318 (52%) were female. Seventy three (12%) patients were healthcare workers (HCW). Two hundred and ninety five(48.2%) patients indicated contact with a COVID-19 patient. Demographic data of the patients are given in Table 1. Out of 612patients, 518 (84.6%) were symptomatic. Fever, cough and shortness of breath were the most common symptoms on admission. Out of 612 patients, 69 (11.2%) were smokers, and 543 (88.8%) were non-smokers. (Table 1)

Table 1: Demographic data of COVID-19 patients admitted to MNR Hospital

	n = 612 (%)
Age	
18-49	330 (54%)
50-64	102 (16.7%)
65-79	89 (14.5%)
≥ 80	91 (14.8%)
Gender	
Female	318 (52)
Male	294 (48%)
Health Care Worker	73 (12%)
Smoking	
Smoker	69 (11.2%)
Non-smoker	543 (88.8%)
Co-morbidities	
Hypertension	177 (29%)
Diabetes Mellitus	85.7 (14%)
Chronic heart disease	62 (10.2%)
Chronic lung disease	57 (9.3%)
Malignancy	26 (4.2%)
Neurologic disease	22 (3.6%)
Chronic renal failure	20 (3.3%)
COVID-19	
PCR positive	453 (74)
PCR negative	159 (26)
History of COVID-19 exposure	295 (48.2)

Patients were sorted based on age groups to determine the difference in demographic data, symptoms, co-morbidities, prognostic laboratory findings and outcome. Co-morbidities of the patients according to age groups are shown in Table 2. Statistically significant difference in terms of symptom existence was not found between age groups. The distribution of symptoms according to age groups are shown in Table 3. Fever, cough and sore throat were the most common symptoms of HCWs. Sore throat, headache, myalgia, loss of smell and taste were specific to the 18-49 year age group (p<0.001).

Table 2: Distribution of demographic data of COVID-19 patients admitted to MNR Hospital by age groups.

Age groups	Female n(%)	Exposure n(%)	Co-morbidities n(%)	Diabetes Mellitus n(%)
18-49	158 (48%)	201 (61%)	69 (21%)	12 (3.7%)
50-64	55 (54%)	54 (53%)	56 (55%)	20 (19.6%)
65-79	50 (55.7%)	23 (26%)	77 (87%)	28 (32%)
80 +	56 (62%)	62 (68%)	86 (94.6%)	26 (28.2%)
Age groups	Chronic heart disease n(%)	Chronic lung disease n(%)	Neurologic disease n(%)	Malignancy n(%)
18-49	30 (9.2%)	13 (4%)	4 (1.2%)	3 (0.8%)
50-64	31 (30%)	12 (12%)	2 (2.4%)	6 (6.2%)
65-79	62 (70%)	21 (24%)	6 (6.8%)	14 (16%)
80 +	67 (73.8%)	10 (11%)	10 (11%)	5 (6%)

Outcome data of COVID-19 patients based on age groups are shown in Table 5. By multivariate logistic regression analysis, it was determined that age significantly affected receiving treatment, hospitalization, and intensive care unit admission, even after correcting for gender, co-morbidities, DM, chronic heart disease and chronic lung disease. When the patients who received treatment were analysed, it was observed that treatment was given less to 18-49 year age group compared to other age groups. This study also found that the presence of co-morbidity significantly increased hospitalization. It was also observed that admission to the ICU was more common in males than females.

Table 3: Distribution of symptoms of COVID-19 patients by age groups

Age groups	Symptom existence n(%)	Fever n (%)	Cough n (%)	Shortness of breath n(%)	Fatigue n (%)	Muscle or body aches n(%)	Arthralgia n (%)
18-49	277 (84%)	102 (31%)	127 (38.6%)	66 (20%)	86 (26%)	36 (11%)	23 (7%)
50-64	89 (87.5%)	36 (35.2%)	48 (46.7%)	21 (20.6%)	23 (22.5%)	11 (10.8%)	3 (2.5%)
65-79	78 (88%)	30 (34%)	35 (39%)	31 (35.2%)	19 (20.8%)	2 (2.5%)	3 (3%)
80 +	74 (81.6)	30 (33.5%)	30 (33.5%)	36 (39.5%)	16 (17.5%)	0 (0.0)	0 (0.0)
Age groups	Sore throat n (%)	Headache n (%)	Loss of taste n (%)	Loss of smell n (%)	Nausea or vomiting n (%)	Diarrhea n (%)	
18-49	69 (21%)	46 (14%)	26 (7.8%)	28 (8.4%)	26 (7.8%)	17 (5%)	
50-64	17 (16.2%)	8 (8.1%)	4 (3.5%)	5 (4.9%)	8 (7.4%)	0 (0.0)	
65-79	3 (3.8)	5 (6%)	0 (0.0)	2 (1.7%)	10 (11%)	4 (4.8%)	
80 +	3 (3.5%)	0 (0.0)	0 (0.0)	0 (0.0)	4 (4.7%)	5 (5.8%)	

Table 4: Distribution of prognostic factors by age groups

Age groups	Lymphopenia (≤ 800) n (%)	CRP elevation (> 50) n (%)	D-dimer (≥ 1) n (%)	Ferritin elevation (≥ 500) n (%)
18-49	76 (23%)	36 (11%)	27 (8.2%)	10 (3%)
50-64	21 (21%)	18 (17.8%)	12 (11.5%)	7 (7%)
65-79	31 (35%)	40 (45.2%)	49 (55%)	17 (18.8%)
80 +	29 (31.8)	41 (45.2%)	61 (66.7%)	21 (22.7%)

Table 5: The outcome of COVID-19 patients by age groups

Age groups	Treatment n (%)	Hospitalization n (%)	ICU n (%)	Exitus at hospitalization n (%)
18-49	264 (80%)	79 (24%)	7 (2%)	
50-64	95 (92.7%)	60 (59.3%)	2 (1.8%)	3 (2.5%)
65-79	85 (95%)	73 (82%)	14 (15.6%)	17 (18.8%)
80 +	89 (97.8%)	81 (89%)	26 (29%)	27 (30%)

Discussion

It was observed that as patients got older, the risk of having a comorbid disease increased as expected. Diabetes mellitus, chronic heart disease and chronic lung disease were found to be the common co-morbidities. Exposure history was lower in the 65-79 year age group, contrary to ≥ 80 years age group. It was found that living conditions also affect the rate of exposure and contact with the virus. When symptoms were analyzed, it was found that younger patients presented with sore throat, anosmia, ageusia and myalgia while older patients presented with shortness of breath (Table 3). Age was an important contributing factor in the number of hospitalizations and admissions to ICU, which ended up increasing mortality rates.

We observed that the risk of co-morbidity increased with ageing. This result correlates with previous studies. Cerebrovascular disease, cardiovascular disease, chronic lung disease and chronic kidney disease were the most reported co-morbidities (4, 13, 14). However, this study showed that co-morbidities varied in specific age groups, which was noticeable. Diabetes mellitus, chronic lung disease and malignancies were significantly higher in the age group 65 - 79, while chronic heart disease and neurological diseases were higher in patients older than 80. Chronic heart diseases increase with age. Cardiovascular system changes, such as thickening of the vascular wall, decrease in heart rate and vascular flexibility that occurs with age, increase the risk of circulatory system disease. The exposure history was lower in the 65-79 years age group than the 18-49 years age group. (Table 2)

Patients with COVID-19 suspicion presented with various symptoms on hospital admission. The most common clinical symptoms were fever, cough, shortness of breath and fatigue. In a recent scoping review to identify the common baseline clinical features of COVID-19, the authors concluded that the

most common symptoms were fever, cough, shortness of breath and fatigue (4) The presenting symptoms were the same in different studies (1, 10,14). However, heterogeneity was pointed in most of the articles by the authors (4). These symptoms are not specific to the disease. Some of the symptoms were determined to be age-specific when we grouped patients by age. Sore throat, headache, myalgia, loss of smell and taste were specific to the 18-49 age group (p<0.001). Among the HCWs, sore throat was one of the most common symptoms because most of them were aged between 18 and 49. Statistical difference was not found in symptom existence, fever, cough and gastrointestinal symptoms between age groups.

Liu et al. did comparative analysis of clinical and laboratory findings in 303 COVID-19 patients of different age groups. According to their study, fatigue was a common symptom in the older age group compared to the younger age group. In middle-aged patients, muscle ache was a common symptom but in younger patients, chest pain was common (10). In another study, Bastug et al. reported that patients admitted to ICU were elderly and symptoms like shortness of breath and dry cough were significantly higher in these patients. However, they did not specify symptoms by age groups. (14). These studies show that dyspnoea was more common in the older age group and affects the prognosis of the disease.

When analysis of poor prognostic factors was done, it was found that CRP, D-dimer and ferritin levels were significantly high in ≥ 65 year age group. In other studies, high levels of D-dimer and ferritin were associated with hospitalization, an outcome that correlates with the older age groups (9, 16,17)).

When the patients who received treatment were analysed, it was found that treatment was given more to other age groups compared to the 18-49 year age group. As hydroxychloroquine produced serious side effects in the 18-49 year age group, some patients refused treatment and in some cases, treatment was not given based on the general condition of the patients. There had been cases where treatment had to be discontinued because of side effects in elderly patients. Therefore, treatment was higher in the 65-79 year age group and ≥ 80 year age group than the 18-49 year age group. This is in agreement with other studies (1)

Similar to other studies in the literature, it was found that hospitalization and ICU admission increased with age, and the result was statistically significant in multivariate logistic regression analysis (1,18,19)).

We observed that presence of co-morbidity significantly increased hospitalization. It was also observed that admission to the ICU was more common in males than females, similar to other studies (1, 18). Various causes like chronic inflammation, chronic heart disease, metabolic syndrome, Alzheimer's disease can cause ferritin and D-dimer elevation in patients aged more than 65 years (20, 21, 22). As this age group has co-morbidities, this situation cannot be linked only to COVID-19. This situation may be clarified in future with further studies.

Our findings can be helpful to identify COVID-19 cases in OPD's and speed up the management of cases. Specific symptoms can be used in the field (such as schools, nursing homes, factories) to identify possible COVID-19 patients and hasten isolation.

Most of the symptoms of COVID-19 resemble other respiratory virus infections. However,

some symptoms like loss of smell and taste, are more specific to COVID. When symptoms were defined according to specific age groups, respiratory symptoms like shortness of breath were common in older age groups. These age-defined symptoms help physicians from different specialities who work in pandemic areas to diagnose COVID-19 with non-respiratory symptoms.

In conclusion, although COVID-19 represents nonspecific symptoms, few symptoms like sore throat, loss of smell and taste, myalgia and headache are more specific to age group 18-49. However, shortness of breath is more specific to patients aged more than 65 years. We found that comorbidities, hospitalization and poor prognostic factors were more common in patients over 65 years. Predominant symptoms and prognostic laboratory findings vary in different age groups, which help the physicians differentiate the disease in clinical practice. Personalised criteria are to be formulated based on various age groups which may help in early screening and diagnosis of COViD-19. Comprehensive analysis of clinical and laboratory findings helps to identify COViD patients with severe prognosis. It is also important for follow up of patients and also to identify the pathophysiology of the disease.

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