

# The Effect of Age on Clinical Presentation in Cases with Moderate to Severe COVID-19 Pneumonia

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## Abstract

**Background:** The coronavirus disease 2019 (COVID-19) is a pandemic caused by the novel severe acute respiratory syndrome coronavirus 2 (SARSCoV-2). The increased number of COVID-19 cases and fatalities is a global threat. With early recognition of the cases, along with vaccination, the spread of the pandemic can be restrained. Infections often present with non-classical complaints in elderly leading to delayed diagnosis and clinical decision. Studying the different presenting patterns of COVID 19 stratified by age will allow for early identification and hence proper triage of cases.

**Aim:** to study the different clinical presentations of COVID 19 in those with moderate to critical pneumonia stratified by age among patients quarantined in the Geriatric Hospital in Ain Shams University during the period from 6/6/2020 to 5/8/2020.

**Subjects and Methods:** a retrospective cohort study involving all patients with moderate to critical COVID-19 pneumonia quarantined at the Geriatric hospital in Ain Shams University (n=314) stratified according to age into 3 groups: those 18-39, 40-59, >60 years old. Epidemiological, demographic, and clinical presentations were obtained from medical records. Missing data in medical records were reported to allow for future improvement in data collection.

**Results:** The patients older than 60 years accounted for 59.23% (186/314) of the patients recruited in this study. Severe cases were more prevalent among those over 60 years. Fever, dyspnea, hypoxia, respiratory distress and dry cough were the most prominent presentations among all groups. Dyspnea was the most prevalent among elderly group n= 72(38.70%). Although fever was a common presentation in elderly, it occurred at a lower incidence among elderly compared to other groups. It presents (27.95%) of elderly compared to 50-53.26% in the other two groups. There was an increased prevalence of delirium among elderly group yet not of statistical significance.

**Conclusion:** COVID-19 pneumonia has a wide variety of clinical presentations, yet respiratory symptoms remains the most common even among the elderly.

**Key words:** COVID-19 pneumonia, elderly, symptoms, clinical presentations.

## Background

The coronavirus disease 2019 (COVID-19) is caused by the novel severe acute respiratory syndrome coronavirus 2 (SARSCoV-2) infection, it presents differently, with symptoms ranging from asymptomatic cases, mild cases up to severe cases of severe pneumonia with or without multi-organ failure.<sup>1</sup>

Gan et al., 2020 reported that about 40% of hospitalized elderly with COVID 19 presented with atypical symptoms including falls, reduced mobility, weakness and confusion as a main complaint in the community.<sup>2</sup> Fever and cough were the most frequent symptoms in elderly patients on admission in the multicenter,

retrospective study by Guo and his colleagues<sup>3</sup>, however they were less prevalent in elderly when compared to other age groups.

A prediction model was developed to predict COVID 19 course and outcome based on time series of clinical symptoms.<sup>4</sup> It reported 6 clusters of symptoms. Cluster 1 and 2 were milder forms of COVID-19 with minimal need for respiratory support. They mainly present with upper respiratory tract symptoms and were distinguished by the absence of muscle pain in Cluster 2 compared to Cluster 1, and slightly increased reports of skipped meals and fever in Cluster 2. Cluster 3 had predominant gastrointestinal symptoms (diarrhea,

skipped meals) and had better outcomes only 3.7% required respiratory support. Cluster 4 presents early with severe fatigue, persistent chest pain and cough, cluster 5 reported confusion, anorexia and severe fatigue. Finally, cluster 6 reported respiratory distress including early onset of dyspnea and chest pain combined with significant abdominal pain, diarrhea and confusion.

The ability to timely diagnose and properly manage cases with COVID 19 in elderly needs adequate study of the different presenting patterns in this age group.

**Aim:** to study the different clinical presentations of COVID 19 in those with moderate to critical pneumonia stratified by age of patients quarantined in the Geriatric Hospital in Ain Shams University during the period from 6/6/2020 to 5/8/2020.

**Methods**

A retrospective cohort study involved all patients with moderate to critical COVID 19 pneumonia quarantined at Geriatric hospital in Ain Shams University stratified according to age into 3 groups: those >18 to 39, 40-59, >60 years.

**Inclusion criteria:** all patients with moderate, severe and critical COVID-19 during the study duration.

**Diagnostic criteria** of COVID-19: Laboratory (RT-PCR) confirmed SARS-Cov-2 infection; CT of the lung conformed to the manifestation of viral pneumonia.<sup>5</sup>

1. Criteria for moderate illness: Individuals with evidence of lower respiratory disease by clinical assessment or imaging and an oxygen saturation (SaO2) over 93% on room air.<sup>5</sup>
2. Criteria for severe illness: Respiratory rate >=30/min; or Rest SPO2<=93%; or PaO2/FiO2<=300mmHg, or more than 50% lung infiltrates.<sup>5</sup>
3. Criteria for critical illness: Individuals with respiratory failure, septic shock, and/or multiple organ dysfunction.<sup>5</sup>

**Exclusion Criteria:** cases with mild COVID 19 and asymptomatic patients with positive PCR confirmed COVID 19 were excluded from the study.

**Study tools and procedures:** Epidemiological, demographic, clinical presentations were obtained from medical records by retrospective reviews after, confidentiality and anonymity of participants was ensured. Missing data in medical records were reported to allow for future improvement in data collection.

**Ethical Considerations:** An informed consent was obtained from each participant upon hospital admission as per the administration protocols. The study methodology was approved by the Research Review Board of the Geriatrics and Gerontology Department, Faculty of Medicine, Ain Shams University. The Hospital administration consent to review the needed data records was obtained. Confidentiality and privacy of data was ensured.

**Statistical analysis:** Data entry and statistical analysis were performed using Statistical Package for Social Science (SPSS) (version 26) Quantitative variables

were presented in the form of means and standard deviation. Qualitative variables presented in the form of frequency tables (number and percent). Comparison between quantitative variables were carried out using ANOVA test. Comparison between qualitative variables was carried out using Pearson’s  $\chi^2$  test.

**Results**

The study enrolled 314 patients stratified according to age, divided into three groups: group A (18- 40 years old) N= 36, group B (40-59 years old) N=92, group C (above 60 years old) N= 168. Severe to critical cases were more common among elderly group N= 108(58.06%) compared to 12(33.3%) and 41(44.5%) in group A and B, respectively. Figure 1

Regarding severity grading, missing data entry was present in 13(4.14%) of cases. Missing data was higher in documented RT-PCR results on admission and smoking status.

Table (2), figures 2a,b,c,d shows that among the wide variety of reported presenting symptoms, only fever, abdominal pain, and hypoxia were significantly affected by age group. The common presenting features among the studied population were fever, dyspnea, hypoxia, respiratory distress and dry cough.

Figure 1: Severity of COVID 19 illness among the three groups

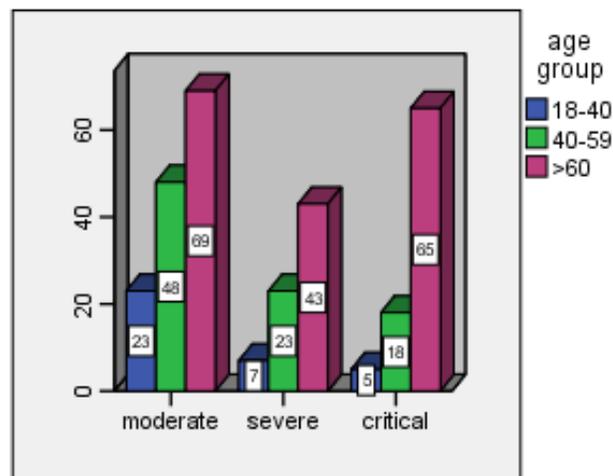


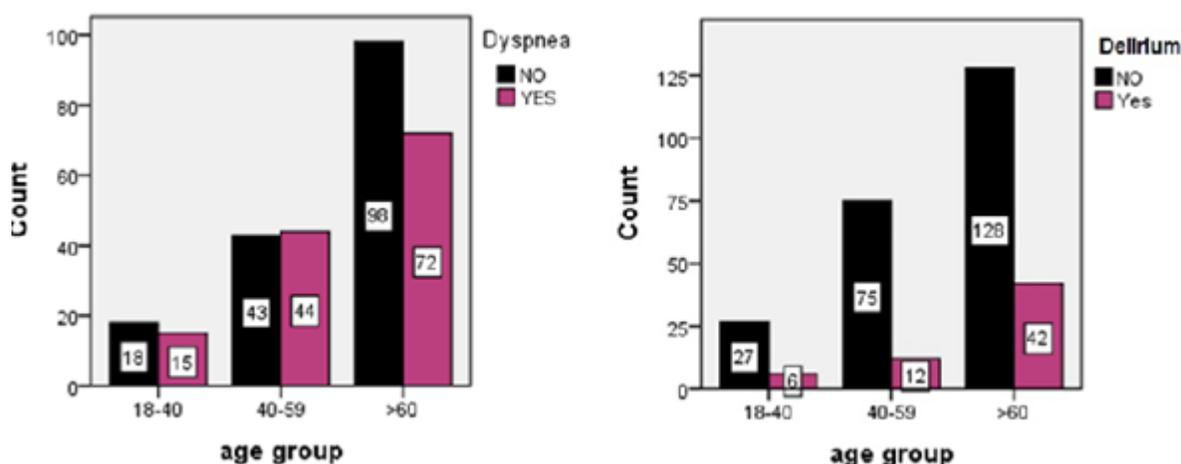
Table1: Demographics of the participants:

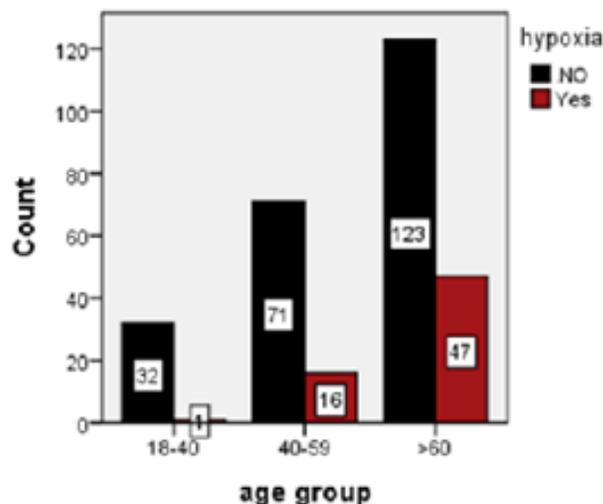
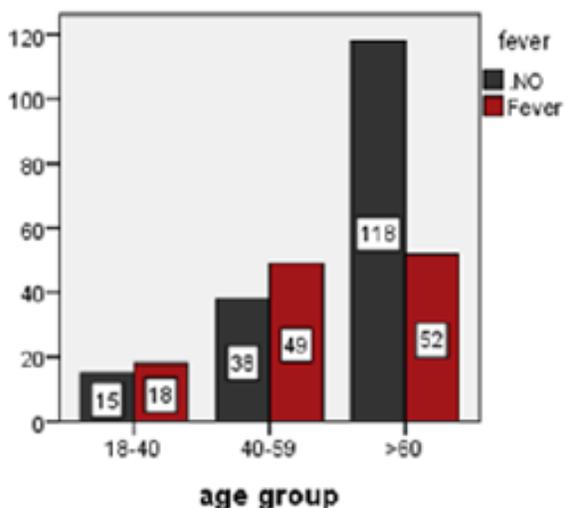
Variable	Group A <40 years old N=36	Group B 40-59 years old N=92	Group C >60 years old N=186	P value
Age mean±SD (years)	30.83±6.73	51.82±5.27	70.34±7.77	0.000¶*
Gender				0.75#
N(%)	Males 16(44.4%)	47(51.1%)	95(51.1%)	
N(%)	Females 20(55.6%)	45(48.9%)	91(48.9%)	
PCR on admission				0.98#
N(%)	Positive 20(55.6%)	47(51.1%)	104(55.9%)	
N(%)	Negative 11(30.55%)	24(26.08%)	53(28.49%)	
N(%)	Missing data 5(13.88%)	21(22.82%)	29(15.59%)	-
Severity of COVID 19 illness				0.005##
N(%)	Moderate 23(63.88%)	48(52.17%)	69(37.09%)	
N(%)	Severe 7(19.44%)	23(25.0%)	43(23.11%)	
N(%)	Critical 5(13.88%)	18(19.56%)	65(34.94%)	
N(%)	Missing data 1(2.77%)	3(3.26%)	9(4.83%)	
Smoking				0.002‡*
N(%)	Current 6(16.67%)	12(13.04%)	14(7.52%)	
N(%)	Ex-smoker 0	4(4.34%)	26(13.97%)	
N(%)	Sheesha 0	2(2.17%)	3(1.61%)	
N(%)	No 22(61.11%)	41(44.56%)	78(41.93%)	
N(%)	Missing data 8(22.22%)	33(35.86%)	65(34.94%)	

Table 2: the prevalence of different presenting symptoms and signs at admission among the three groups

Variable	Group A <40 years old N=36	Group B 40-59 years old N=92	Group C >60 years old N=186	P value
Fever	18(50.0%)	49(53.26%)	52(27.95%)	0.000*
Cough				0.18
Dry	9(25.0%)	26(28.26%)	37(19.89%)	
productive	3(8.33%)	7(7.60%)	6(4.83%)	
Delirium	6(9.52%)	12(13.04%)	42(22.58%)	0.11
Diarrhea	4(11.11%)	3(3.26%)	12(6.45%)	0.21
Abdominal pain	3(8.33%)	2(2.17%)	1(0.53%)	0.013*
Vomiting	2(5.55%)	2(2.17%)	8(4.30%)	0.62
Sore throat	0	0	0	-
Dyspnea	15(41.66%)	44(47.82%)	72(38.70%)	0.45
Severe respiratory distress	4(11.11%)	11(11.95%)	35(18.81%)	0.19
Hypoxia	1(2.77%)	16(17.39%)	47(25.26%)	0.005*
Fatigue	3(8.33%)	7(7.60%)	8(4.30%)	0.9
Malaise	0	3(3.26%)	4(2.15%)	0.37
anosmia	0	0	0	-
Chest pain	1(2.77%)	1(1.08%)	8(4.30%)	0.36
Missing data	3(8.33%)	5(5.43%)	16(8.60%)	-

Figure 2: the distribution of most common presentations in different groups





Discussion

The current study done to describe the presentations of moderate to critical COVID 19 pneumonia in different age groups in the geriatric quarantine hospital in Ain Shams University during the period from 6/6/2020 to 5/8/2020.

The study enrolled 314 patients stratified according to age, divided into three groups: group A (below 40 years old), group B (40-59 years old), and group C (above 60 years old), each group of them were divided into males and females.

Our study showed a significant association between age and the severity of the disease, severe to critical cases were more common among elderly group N= 108(58.06%) compared to 12(33.3%) and 41(44.5%) in group A and B, respectively.

According to CDC,<sup>6</sup> risk for severe illness with COVID-19 increases with age, with older adults at highest risk. With 8 out of 10 COVID 19 deaths in USA occurred in older adults (>65 years).

Guan and colleagues, 2019<sup>7</sup> reported that patients with severe disease were older than those with non-severe disease by a median of 7 years. This agrees with a study by Liu et al <sup>8</sup> who found that the presence of COVID-19 patients with grade IV and V pneumonia using the Pneumonia Severity Index was higher among elderly patients compared to young and middle-aged patients

In our work we found no significant association between gender and hospitalization with COVID-19 infection, the percentage of patients of both genders was found to be almost equal the three groups. In group(A):males were 44.4% , females were 55.6%, group(B):males were 51.1% , females were 48.9%, group(C):males were 51.1% , females were 48.9%, that is in accordance with the WHO advocacy Brief, reporting that with a preliminary analysis of the data; there was a relatively even distribution of

infections between women and men (47% versus 51%, respectively), however, there was some differences across age groups which needs careful interpretation. WHO suggested the possibility of geographical variations in infection rates and deaths; however, available data were obtained from few countries and were therefore skewed.<sup>9</sup> However, other studies showed male predominance in COVID 19 infection. A study including 155 consecutive confirmed cases with in Zhongnan Hospital of Wuhan University reported that 56% of cases were male.<sup>10</sup> Similarly, male gender was a significant independent predictor for COVID-19 infection as they were at higher risk for the virus using regression analysis.<sup>11</sup>

On the contrary, The Korean Society of Infectious Diseases reported that 37.7% of COVID 19 infections were males while 62.3% were female. This difference was attributed to gender difference in the social activities.<sup>12</sup> However, the possible mechanisms for gender difference in COVID 19 infection remain unknown. Studies suggested difference in innate and adaptive immunity, hormonal effects, and changes in the expression of angiotensin converting enzyme 2 receptors ACE2 among the possible causes for gender difference in viral infection susceptibility.<sup>13</sup>

The current study showed that about 50% of the patients in three groups had a positive RT-PCR testing on admission. Although, it was suggested that the RT-PCR testing has a sensitivity of up to 95% .<sup>14</sup> Gan et al., <sup>2</sup> reported positive results in 87% of the elderly included in their study.<sup>2</sup>

Ai and colleagues reported that the sensitivity of the test was only 60–70%. Therefore, COVID-19 exclusion can't be affirmed on the basis of negative test alone and CT chest in suspected cases may had a higher sensitivity.<sup>15</sup>

According to Xiao et al., 2020, older individuals with weaker immune functions, patients (≥65 years) had a significant longer time interval (18 days) to obtain positive RT-PCR test result than patients < 65 years (14 days).<sup>16</sup>

A systematic review found that, nasopharyngeal sampling

was positive in approximately 89% within 4 days of either symptom onset. Delayed test for 10 days after symptom onset greatly reduced the positive results significantly.<sup>17</sup> Factors affecting the accuracy of RT-PCR testing includes sampling sites, methods, and time from symptom onset.<sup>17</sup> Surprisingly, most of our participants with validated history were nonsmoker. According to Simons et al., 2020, compared to nonsmokers, current smokers appeared to have reduced risk of COVID 19, while former smokers(x-smoker) appeared to have increased risk of hospitalization, increased disease severity and mortality from COVID-19.<sup>18</sup> However, they commented that their findings shouldn't suggest a protective effect of nicotine, and further investigations were needed.<sup>18</sup>

Leung et al., 2020 showed that current smokers showed a higher expression of ACE-2 gene expression than non-smokers, but they were surprised by the relative underrepresentation of current smokers in (COVID-19) patients. Possible explanation of that is misclassification of smoking status due to underreported smoking status and smokers may use some useful medications as some inhalers which may give some protection against COVID-19 (e.g. certain inhalers).<sup>19</sup>

Regarding the presenting symptoms, fever, dyspnea and dry cough were the most common in all age groups. In the elderly group hypoxia on admission was more common than other age groups which can be explained by increased severity of disease with ageing.

In the current study, fever was less common in the older adults compared to the other two groups. This was agreed with the study by Zhao and colleagues 2020, who reported that, the most common symptoms at onset of COVID 19 pneumonia were fever and cough. Less common symptoms included sore throat, fatigue, diarrhea and chest tightness.<sup>20</sup> similarly, the same pattern of symptoms distribution were reported in elderly patients with typical COVID 19 presentation.<sup>2</sup>

The fever was less reported in elderly in many infections<sup>21</sup> and COVID 19<sup>4</sup> as well. Older and frailer adults have a lower basal temperature and their immune system responds with a lower pyrogenic response to infection.<sup>21</sup>

It is well recognized that older adults in acute illness states commonly present with atypical symptoms of falls, reduced mobility or delirium, and it is apparent that this is the case with COVID-19.<sup>2</sup> However, the medical records included in our study during the study duration didn't include any documentation of atypical symptoms beyond delirium which was reported by 22.58% of the elderly participants.

Moreover, these documentation discrepancies were reported by Simon and colleague regarding smoking status. Seventy-eight studies included in their systematic review, reported the proportion of missing data on smoking status ranging from 0.08 to 96.4%.<sup>18</sup>

Time and stress constraints facing the medical registrars during the pandemic may be substantial factors for inadequate medical records. Being assessed by a non-geriatric physician might be another cause for not reporting atypical presentations.

It may be difficult to find time to organize all clinical information, thus; using electronic medical records with standard format can be a proper solution for such a problem, moreover, coded forms may be another solution. Knowing the exact weakness points in the data recording process using quality assessment studies may be helpful in suggesting the proper needed modifications in the documentation process during the pandemic.

Conclusion: severe to critical COVID-19 pneumonia prevalence was higher in the elderly patients. There is a wide variety of reported presenting symptoms, but only fever, abdominal pain, and hypoxia were significantly affected by age group. Medical records during COVID-19 pandemic needs further validation.

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