Characteristics of patients with COVID-19 pneumonia at Hvidovre Hospital, March-April 2020

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ABSTRACT

INTRODUCTION: The first case of coronavirus disease 2019 (COVID-19) disease caused by severe acute respiratory syndrome coronavirus-2 occurred in Denmark on 27 February 2020. On 10 March, the first case of COVID-19 pneumonia was admitted to Hvidovre Hospital.

METHODS: Retrospective case review of individuals 18 years or older who were admitted consecutively to Hvidovre Hospital from 10 March through 23 April 2020.

RESULTS: A total of 175 individuals were admitted with COVID-19 pneumonia. The median age was 71 years, 48.6% were male and 71% had at least one co-morbidity. The most commonly presenting symptoms were dyspnoea, dry cough, and fever. The majority of patients had lymphopenia, elevated liver function tests and C-reactive protein. Nearly two in three presented with multilobar infiltration by chest X-ray. Respiratory failure leading to invasive mechanical ventilation developed in 27 patients (15.4%). By 20 April, 23 of 175 (13.1%) patients remained hospitalised, 43 (24.6%) had died and 109 (62.3%) had been discharged.

CONCLUSIONS: The manifestations of COVID-19 at presentation were similar to those seen in other reports. Our population was older, slightly overrepresented by women and had a high level of co-morbidity. COVID-19 admittance was associated with frequent need of intensive care and mechanical ventilation that was associated with a very high mortality.

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The first case of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) occurred in Denmark on 27 February this year [1]. On 10 March, the first case of COVID-19 pneumonia was admitted to Hvidovre Hospital.

We here report hospitalisation and intensive care unit (ICU) need of the first 175 individuals admitted during March and April of 2020 at Hvidovre Hospital, a university-affiliated hospital in Copenhagen, Denmark, serving a catchment area of 550,000 individuals. We describe baseline differences in patients with and without a need for ventilatory support, and present clinical and laboratory findings for each patient category. This report contributes to the knowledge of COVID-19 in hospitalised patients in Denmark, which at current is limited to a report on 16 patients receiving intensive care at Roskilde Hospital [2] and an analysis on the impact of cardiovascular medication on the outcome of 689 patients from two Danish Regions [3].

METHODS

This retrospective case series included adults 18 years of age or older with a new-onset pulmonary infiltrate and confirmed SARS-CoV-2 infection who were consecutively admitted between 10 March and 23 April 2020 at a 700-bed university-affiliated hospital in Copenhagen. Cases were confirmed through reverse-transcriptase-polymerase-chain-reaction assays performed on an oropharyngeal swab or a lower respiratory tract specimen. Data were transferred from electronic health records by the involved departments. The study was approved by the Danish Patient Safety Authority (record no. 31-1521-309) and the Regional Data Protection Center (record no. P-2020-492). Data were entered into an electronic data capture tool hosted by the Capital Region of Denmark [4, 5]. Continuous and categorical variables were presented as median and interquartile range or mean and standard deviation and n (%), respectively. We used the Mann-Whitney U test, the χ^2 test or Fisher's exact test to compare differences between patients not requiring or requiring mechanical ventilation as appropriate. Statistical analysis was done using R version 3.6.1.

Trial registration: not relevant.

RESULTS

At admission, the median age was 71 years, 48.6% were male, and 55.8% were ever smokers (**Table 1**). The most common co-morbidity was hypertension followed by diabetes; 71% had at least one co-morbidity. The mean BMI was 28.5 kg/m². The most commonly presenting symptoms were dyspnoea, dry cough, and fever (**Table 2**). The majority of patients had lymphopenia in peripheral blood and had elevated liver function tests and C-reactive protein in plasma (**Table 3**). Nearly two in three presented with multilobar infiltration by chest

X-ray (Table 2). By 23 April, respiratory failure leading to invasive mechanical ventilation had developed in 27 patients (15.4%). Of these, nine (33%) were further referred to extracorporeal membrane oxygenation. Sixteen of 27 patients required continuous renal replacement therapy during intensive care unit admission. Patients who received invasive mechanical ventilation were more likely to be in respiratory distress at admission, with a lower systolic blood pressure and with multilobar pulmonary infiltration. Furthermore, this group was more likely to have elevated liver function tests and C-reactive protein than were patients who did not receive invasive mechanical ventilation (Table 1, Table 2 and Table 3).

By 20 April, 23 of 175 (13.1%) patients remained hospitalised, 43 (24.6%) had died and 109 (62.3%) had been discharged from hospital (**Figure 1**). The median follow-up time to one of these outcomes was four (1-9) days. Among 27 patients requiring mechanical ventilation, 17 had died (59.3%), eight remained in intensive care (29.6%) and three had been discharged (11.1%).

DISCUSSION

Among 175 patients with COVID-19 who were hospitalised, the manifestations of the disease at presentation were generally similar to those of several large case series from China and the United States [6-10].

However, the population described here was older, affected more women proportionally, and individuals had a high level of co-morbidity. Despite the older age spectrum, the mortality of 24.6% reported in our analysis was similar to that reported in several studies [6, 7, 9] although higher than in one report from the US [8]. Unlike most previous studies but similar to experiences from Northern California, adults across all age groups required inpatient or intensive care. Individuals aged 60 to 79 years, however, were more likely to require hospitalisation [10].

The percentage of patients in our case series who received invasive mechanical ventilation was 15.4%. This is higher than reported in a large series from China [7], similar to a report from Wuhan [6], but considerably lower than in reports from the US [8-10]. This discrepancy may be explained by the fact that admittance to an ICU in Denmark is largely limited to patients requiring intubation. Mortality in the ICU was high (59.3%). Early reports from Wuhan reported a staggering 97% mortality related to mechanical ventilation [6]. Mortality proportions after ICU care are somewhat lower in more recent reports [7-10]. A Danish report from Region Zealand described a mortality of 43% [9]. Comparison between each series is difficult due to variable case mix and small sample sizes.

In line with reports from China, Italy and the US, the majority of patients admitted to Hvidovre Hospital

TABLE 1 / Clinical characteristics of 175 patients with coronavirus disease 2019 pneumonia.

	Adults treated on a general ward or intermediate care unit (n = 148)	Adults treated in the intensive care unit (n = 27)	All (N = 175)	p-value
Age, yrs, median (IQR)	73 (55-83)	68 (60-72)	71 (55-81)	-
Males, n (%)	69 (46.6)	16 (59.3)	85 (48.6)	0.32
Tobacco use, n (%)[a]				0.68
Ever	51 (57.3)	12 (50.0)	63 (55.8)	
Never	38 (42.7)	12 (50.0)	50 (44.2)	
Alcohol use, n (%)[b]				1.00
Low-moderate	73 (93.6)	20 (95.2)	93 (93.9)	
High	5 (6.4)	1 (4.8)	6 (6.1)	
BMI, kg/m^2, mean (± SD)	28.2 (± 5.6)	29.6 (± 6.5)	28.5 (± 5.8)	0.30
Diabetes, n (%)	38 (25.7)	8 (29.6)	46 (26.3)	0.84
Hypertension, n (%)	62 (41.9)	11 (40.7)	73 (41.7)	1.00
Chronic obstructive pulmonary disease, n (%)	9 (6.1)	2 (7.4)	11 (6.3)	1.00
Asthma, n (%)	14 (9.5)	6 (22.2)	20 (11.4)	0.11
Cardiovascular disease, n (%)	76 (51.4)	14 (51.9)	90 (51.4)	1.00
Status on 20 April, 2020				-
Admitted in hospital	15 (10.1)	8 (29.6)	23 (13.1)	
Discharged from hospital	106 (71.6)	3 (11.1)	109 (62.3)	
Dead	27 (18.2)	16 (59.3)	43 (24.6)	

IQR = interquartile range; SD = standard deviation.
a) Smoking status was available for 113 patients.
b) Alcohol use was available for 99 patients.

TABLE 2 / Symptoms and findings at admission of 175 patients with coronavirus disease 2019 pneumonia.

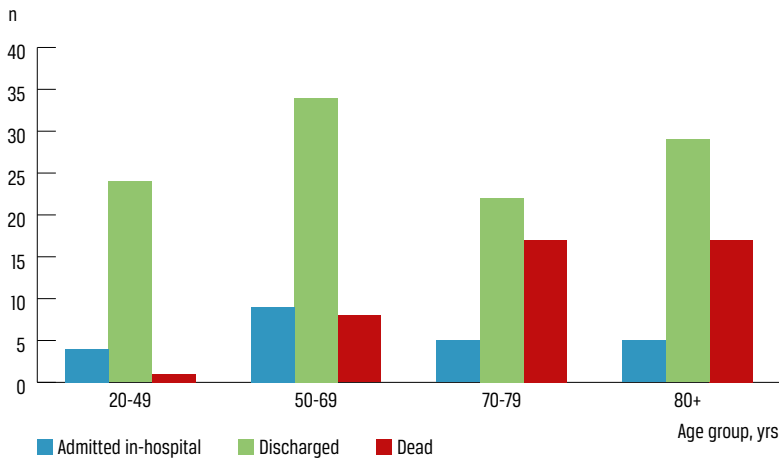|	Adults treated on a general ward or intermediate care unit (n = 148)	Adults treated in the intensive care unit (n = 27)	All (N = 175)	p-value
Glasgow Coma Scale score, median (IQR)	15 (15-15)	15 (15-15)	15 (15-15)	0.20
Respiratory rate/min., median (IQR)	20 (18-24)	24 (20-30)	20 (18-26)	0.001
O_2 saturation, %, median (IQR)	96 (94-98)	94.5 (89-95)	96(93-97)	‹ 0.001
Supplemental O_2, l/min., median (IQR)	0 (0-2)	8.5 (2-15)	0 (0-3)	‹ 0.0001
Systolic blood pressure, mmHg, mean (± SD)	135 (± 19.7)	125 (± 20.9)	134 (± 20.2)	0.02
Heart rate/min., mean (± SD)	87 (± 15.6)	91 (± 18.2)	88 (± 16)	0.26
Temperature, ºC, mean (± SD)	38 (± 0.9)	38 (± 1.1)	38 (± 0.9)	0.98
Chest X-ray findings, n (%)				‹ 0.01
Infiltration	72 (48.6)	4 (14.8)	76 (43.4)	
Multilobular	76 (51.4)	23 (85.2)	99 (56.6)	
Symptoms				
Time with symptoms, days, median (IQR)	7 (5-12)	7 (5-10)	7 (5-12)	0.73
Fever, n (%)	119 (80.4)	18 (66.7)	137 (78.3)	0.18
Dry cough, n (%)	73 (49.3)	13 (48.1)	86 (49.1)	1.00
Expectoration, n (%)	40 (27.0)	3 (11.1)	43 (24.6)	0.13
Dyspnoea, n (%)	91 (61.5)	20 (74.1)	111 (63.4)	0.30
Fatigue, n (%)	27 (18.2)	8 (29.6)	35 (20.0)	0.27
Myalgia, n (%)	39 (26.4)	7 (25.9)	46 (26.3)	1.00
Diarrhoea, n (%)	24 (16.2)	7 (25.9)	31 (17.7)	0.35
Nausea or vomiting, n (%)	30 (20.3)	3 (11.1)	33 (18.9)	0.39
Headache, n (%)	27 (18.2)	5 (18.5)	32 (18.3)	1.00
Sore throat, n (%)	27 (18.2)	4 (14.8)	31 (17.7)	0.88
Altered sense of taste, n (%)	4 (2.7)	1 (3.7)	5 (2.9)	1.00
Medication, n (%)				
Blood pressure lowering drugs	69 (46.6)	13 (48.1)	82 (46.9)	1.00
Corticosteroid treatment	8 (5.4)	1 (3.7)	9 (5.1)	1.00
Immunomodulating treatment	6 (4.1)	2 (7.4)	8 (4.6)	0.79
Inhaled drugs	33 (22.3)	8 (29.6)	41 (23.4)	0.56
Glucose lowering drugs	32 (21.6)	6 (22.2)	38 (21.7)	1.00

IQR = interquartile range; SD = standard deviation.

TABLE 3 / Laboratory findings at admission to hospital. The values are median concentration (interquartile range).

	Adults treated on a general ward or intermediate care unit (n = 148)	Adults treated in the intensive care unit (n = 27)	All (N = 175)	p-value
Blood lymphocytes, × 10^9/l	1 (0.7-1.4)	0.9 (0.6-1.3)	1 (0.7-1.3)	0.39
Blood platelets, × 10^9/l	187 (157-250)	197 (165-238)	189 (158-249)	0.90
Plasma creatinine, µmol/l	87 (71-111)	94 (77-111)	90 (72-111)	0.67
Plasma alanine aminotransferase, U/l	29 (19-45)	36 (25-75)	31 (20-46)	0.03
Plasma lactate dehydrogenase, U/l	280 (222-371)	443 (333-649)	299 (226-389)	‹ 0.0001
Plasma C-reactive protein, mg/l	56 (29-120)	130 (72-.180)	68 (36-130)	‹ 0.001

with COVID-19 had co-morbidity of which hypertension and diabetes were the most common [11]. Rates of co-morbidity did not differ for patients treated in and out of intensive care. A significant proportion of the population described in this report was obese. At least two reports suggest that overweight is a risk factor for hospitalisation for severe COVID-19 and need of critical care [12, 13]. Nearly two in every five individuals admitted with COVID-19 had a BMI exceeding 30 kg/m^2. However, overweight was not associated with a

FIGURE 1 / Outcome of coronavirus disease 2019 pneumonia at Hvidovre Hospital 10 March through 20 April 2020, by age group.

was older, slightly overrepresented by women and had a high level of co-morbidity. COVID-19 admittance was associated with a frequent need of intensive care and mechanical ventilation that was associated with a very high mortality.

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need of intensive care and mechanical ventilation. Tobacco smoking was more frequent among individuals requiring mechanical ventilation than among individuals not requiring mechanical ventilation in a report from China [7]. The proportion of individuals who had ever smoked was high in our population. However, smoking was not associated with a need of intensive care and mechanical ventilation.

These findings underscore the importance of public health interventions, similar to the lockdown strategy adopted by Denmark on 11 March 2020, that prevent transmission for the entire public to mitigate hospital surges.

The major limitation of this study is that our data represent an early phase of SARS-CoV-2 transmission in Denmark. Furthermore, we report only on individuals admitted with COVID-19 pneumonia to a single large hospital in Copenhagen.

CONCLUSIONS
The manifestations of COVID-19 at presentation were similar to those seen in other reports. Our population