



Characteristics of SARS-CoV-2 patients dying in Italy Report based on available data on November 25th, 2020

1. Sample

The present report describes characteristics of 49,931 SARS-CoV-2 patients dying in Italy.* Geographic distribution across the 19 regions and 2 autonomous provinces of Trento and Bozen is presented in the table below. Data are update to November 25th, 2020.

Table 1. Geographic distribution of deceased patients SARS-CoV-2 positive

REGION	N	%
Lombardia	20,978	42.0
Emilia Romagna	5,439	10.9
Piemonte	4,108	8.2
Veneto	3,449	6.9
Liguria	2,301	4.6
Lazio	2,195	4.4
Toscana	1,879	3.8
Campania	1,858	3.7
Sicilia	1,318	2.6
Puglia	1,313	2.6
Marche	1,119	2.2
Abruzzo	836	1.7
Friuli Venezia Giulia	633	1.3
Trento	599	1.2
Bolzano	507	1.0
Sardegna	355	0.7
Umbria	339	0.7
Valle d'Aosta	286	0.6
Calabria	195	0.4
Basilicata	121	0.2
Molise	103	0.2
Total	49,931	100.0

* SARS-CoV-2 related deaths presented in this report are those occurring in patients who test positive for SARS-CoV-2RT by PCR, independently from pre-existing diseases.

2. Demographics

Mean age of patients dying for SARS-CoV-2 infection was 80 years (median 82, range 0-109, IQR 74-88). Women were 21,035 (42.1%). *Figure 1* shows that median age of patients dying for SARS-CoV-2 infection was more than 30 years higher as compared with the national sample diagnosed with SARS-CoV-2 infection (median age 48 years). *Figure 2* shows the absolute number of deaths by age group. Women dying for SARS-CoV-2 infection had an older age than men (median age women 85 - median age men 80).

Figure 1. Median age of patients with SARS-CoV-2 infection and SARS-CoV-2 positive deceased patients

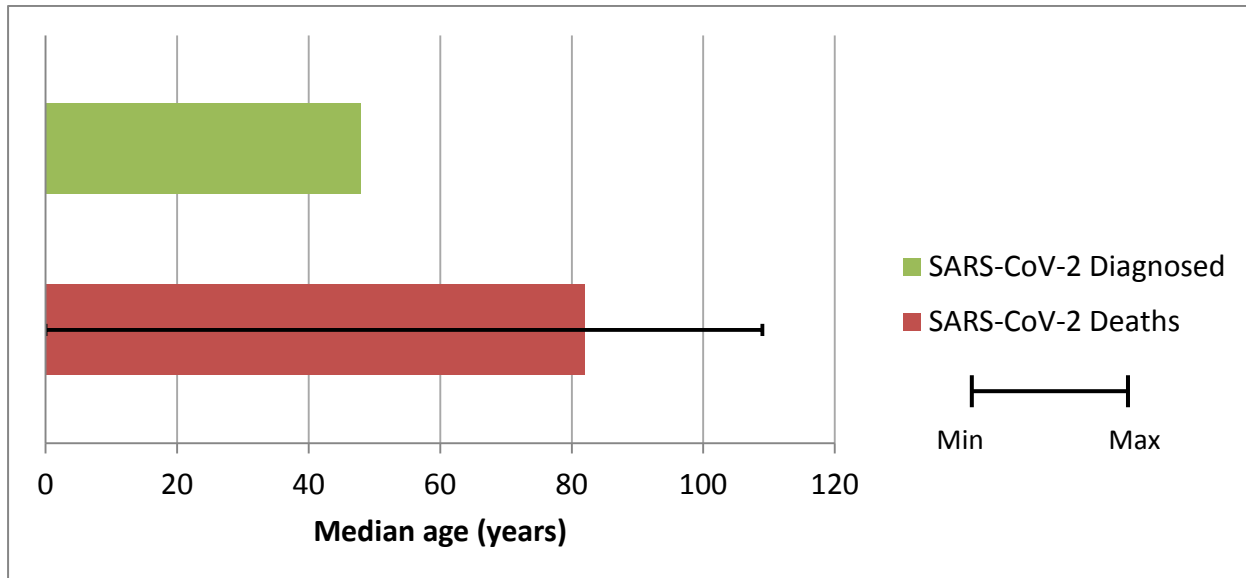
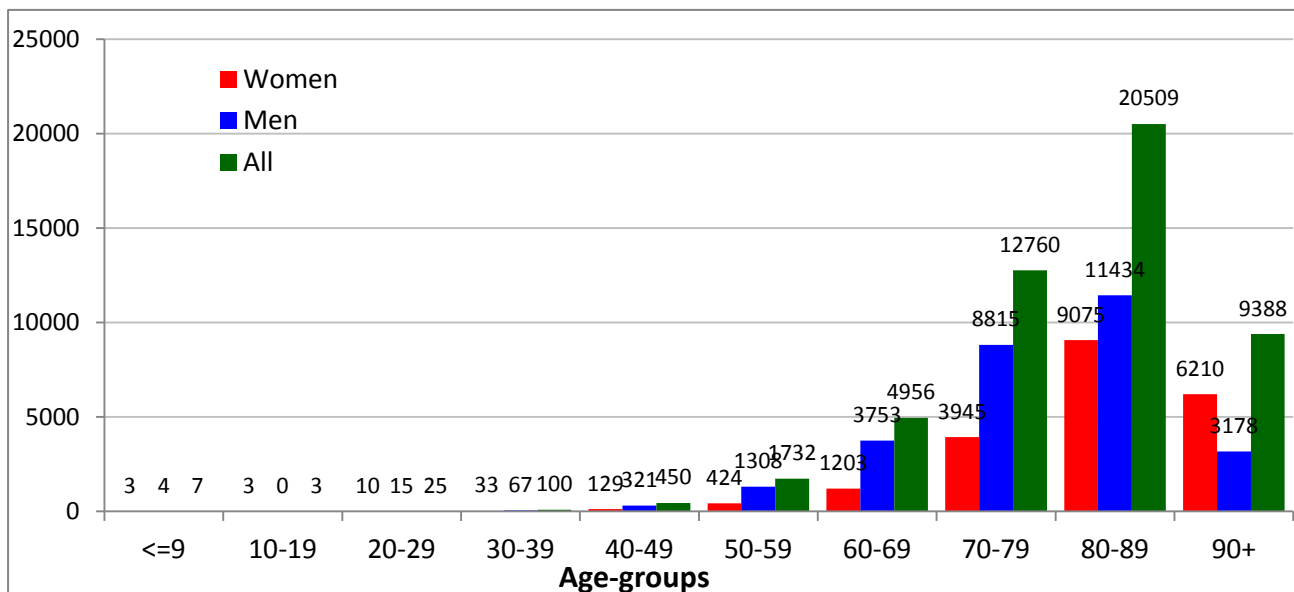


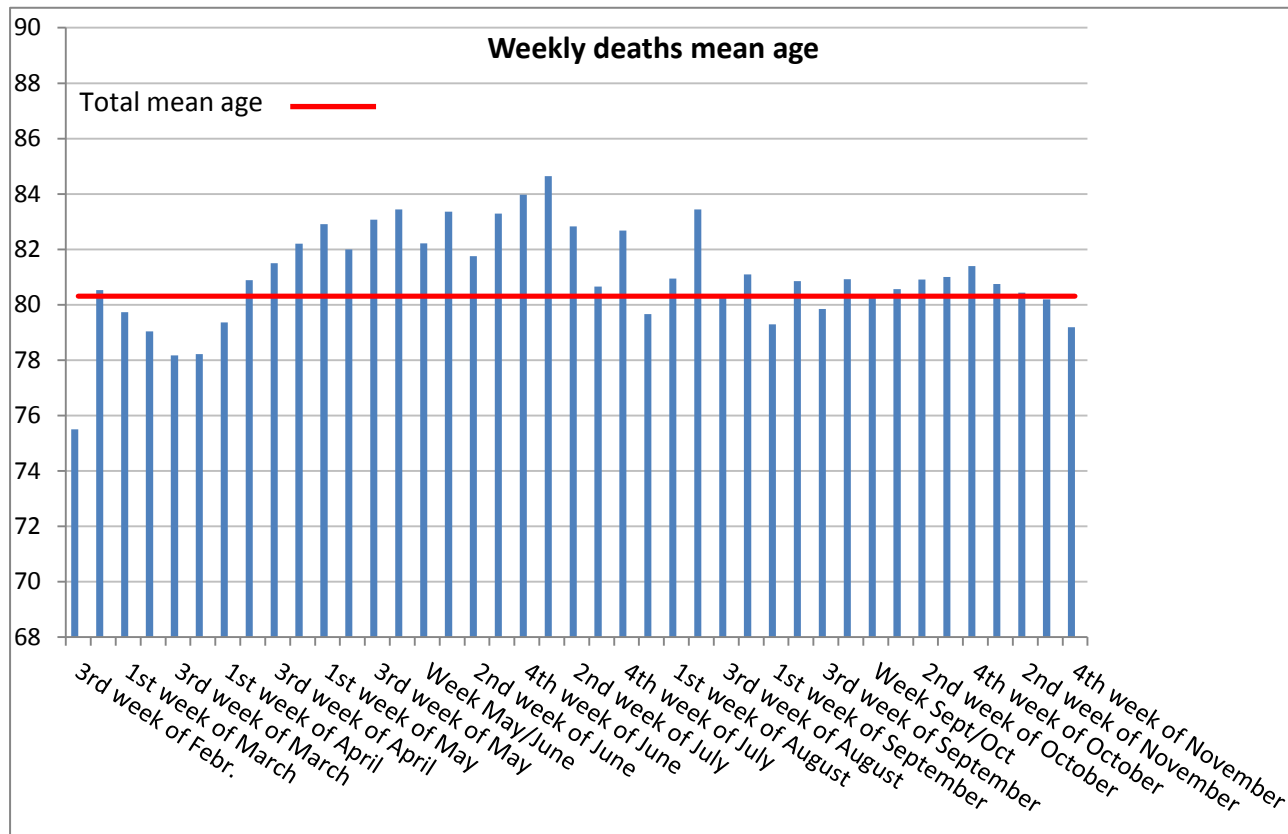
Figure 2. Absolute number of deaths by age group



Note: For 1 deceased person, age was not possible to be evaluated

Figure 3 shows the trend in the average age of SARS-CoV-2 positive deceased patients per calendar week, starting from the 3rd week of February 2020 (the date of the first death dates back to 21st February 2020). The average age of weekly deceased persons has substantially increased up to 85 years (1st week of July) and then dropped slightly.

Figure 3. Mean age of SARS-CoV-2 positive deceased patients by week of death



3. Pre-existing conditions

Table 2 presents most common comorbidities diagnosed before SARS-CoV-2 infection. Data on diseases were based on chart review and was available on 5,592 patients dying in-hospital for whom it was possible to analyse clinic charts. Mean number of diseases was 3.6 (median 3, SD 2.1). Overall, 3.2% of the sample presented with a no comorbidities, 12.6% with a single comorbidity, 18.5% with 2, and 65.7% with 3 or more.

Before hospitalization, 21% of SARS-CoV-2 positive deceased patients followed ACE-inhibitor therapy and 14% angiotensin receptor blockers-ARBs therapy. This information can be underestimated because data on drug treatment before admission were not always described in the chart.

Table 2. Most common comorbidities observed in SARS-CoV-2 positive deceased patients

Diseases	N	%
<i>Ischemic heart disease</i>	1,553	27.8
<i>Atrial Fibrillation</i>	1,359	24.3
<i>Heart failure</i>	920	16.5
<i>Stroke</i>	638	11.4
<i>Hypertension</i>	3,690	66.0
<i>Type 2-Diabetes</i>	1,644	29.4
<i>Dementia</i>	1,282	22.9
<i>COPD (Chronic Obstructive Pulmonary Disease)</i>	968	17.3
<i>Active cancer in the past 5 years</i>	964	17.2
<i>Chronic liver disease</i>	260	4.6
<i>Chronic renal failure</i>	1,185	21.2
<i>Dialysis</i>	120	2.1
<i>Respiratory failure</i>	379	6.8
<i>HIV Infection</i>	13	0.2
<i>Autoimmune diseases</i>	243	4.3
<i>Obesity</i>	575	10.3
Number of comorbidities		
<i>0 comorbidities</i>	178	3.2
<i>1 comorbidity</i>	702	12.6
<i>2 comorbidities</i>	1,036	18.5
<i>3 comorbidities and over</i>	3,676	65.7

Table 3 presents the most common pre-existing chronic pathologies in patients who died, separately in men (n = 3,363) and women (n = 2,229). The average number of pathologies observed in women is 3.8 (median 4, Standard Deviation 2.0). In men the average number of pathologies observed is 3.5 (median 3, Standard Deviation 2.1).

Table 3. Most common comorbidities observed in SARS-CoV-2 positive deceased patients by gender

Diseases	Women		Men	
	N	%	N	%
<i>Ischemic heart disease</i>	517	23.2	1,036	30.8
<i>Atrial Fibrillation</i>	576	25.8	783	23.3
<i>Heart Failure</i>	427	18.7	493	14.4
<i>Stroke</i>	275	12.3	363	10.8
<i>Hypertension</i>	1,527	68.5	2,163	64.3
<i>Type 2-Diabetes</i>	601	27.0	1,043	31.0
<i>Dementia</i>	710	31.9	572	17.0
<i>COPD (Chronic Obstructive Pulmonary Disease)</i>	308	13.8	660	19.6
<i>Active cancer in the past 5 years</i>	356	16.0	608	18.1
<i>Chronic liver disease</i>	91	4.1	169	5.0
<i>Chronic renal failure</i>	431	19.3	754	22.4
<i>Dialysis</i>	36	1.6	84	2.5
<i>Respiratory failure</i>	155	7.0	224	6.7
<i>HIV Infection</i>	2	0.1	11	0.3
<i>Autoimmune diseases</i>	139	6.2	104	3.1
<i>Obesity</i>	228	10.2	347	10.3
Number of comorbidities				
<i>0 comorbidities</i>	45	2.0	133	4.0
<i>1 comorbidity</i>	243	10.9	459	13.6
<i>2 comorbidities</i>	382	17.1	654	19.4
<i>3 comorbidities and over</i>	1,559	69.9	2,117	62.9

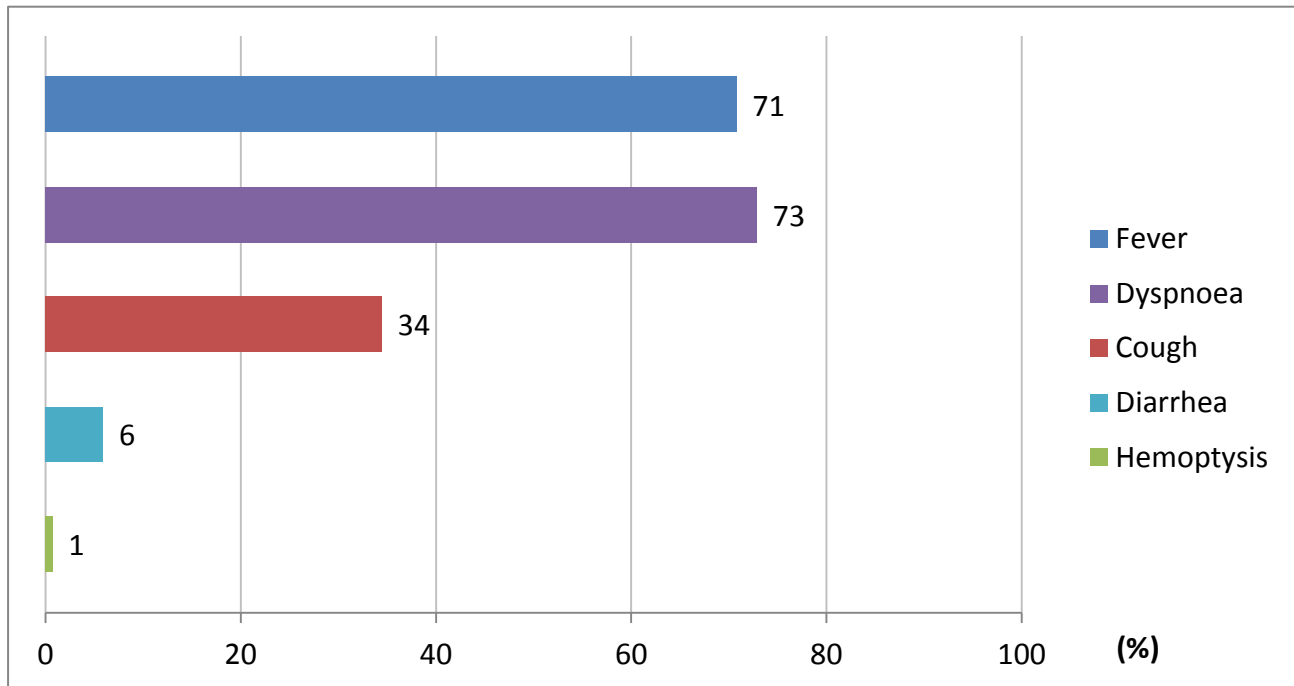
4. Diagnosis of hospitalization

In 90.8% of hospitalizations, conditions (e.g. pneumonia, respiratory failure) or symptoms (e.g. fever, dyspnoea, cough) compatible with SARS-CoV-2 were mentioned. In 479 cases (9.2% of cases) the diagnosis of hospitalization was not related to the infection. In 70 cases the diagnosis of hospitalization concerned exclusively neoplastic pathologies, in 161 cases cardiovascular pathologies (for example Acute Myocardial Infarction-AMI, heart failure, stroke), in 67 cases gastrointestinal pathologies (for example cholecystitis, perforation of the intestine, intestinal obstruction, cirrhosis), in 181 cases other pathologies.

5. Symptoms

Figure 4 shows symptoms most commonly observed at hospital admission. Fever, dyspnoea and cough were the most commonly observed symptoms, while diarrhoea and haemoptysis were less commonly observed. Overall, 8.1% of patients did not present any symptoms at hospital admission.

Figure 4. Most common symptoms observed in SARS-CoV-2 positive deceased patients



6. Acute conditions

Acute Respiratory Distress syndrome was observed in the majority of patients (94.0% of cases), followed by acute renal failure (23.5%). Superinfection was observed in 19.3% and acute cardiac injury in 10.9% of cases.

7. Treatments

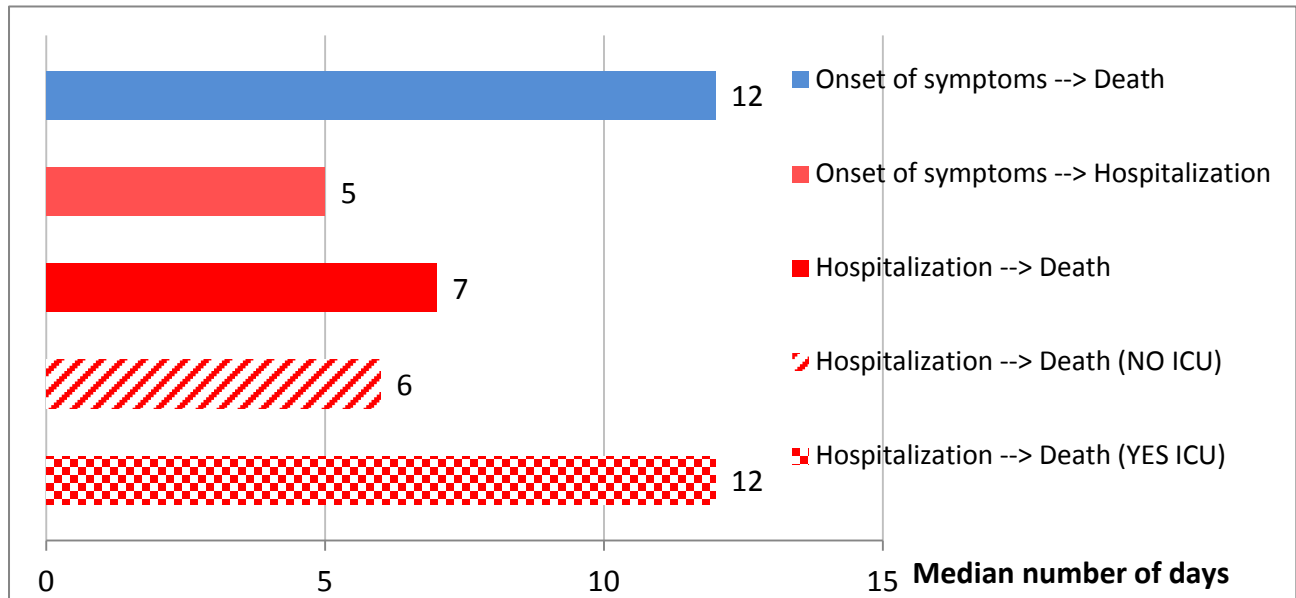
Antibiotics were used by 86.0% of patients during hospital stay, while less used were antivirals (51.1%) and corticosteroids (49.0%). Concomitant use of these 3 treatments was observed in 24.8% of cases.

Out of SARS-CoV-2 positive deceased patients, 4.1% were treated with Tocilizumab during hospitalization.

8. Time-line

Figure 5 shows, for SARS-CoV-2 positive deceased patients, the median times, in days, from the onset of symptoms to death (12 days), from the onset of symptoms to hospitalization (5 days) and from hospitalization to death (7 days). The time from hospitalization to death was 6 days longer in those who were transferred to intensive care than those who were not transferred (12 days vs. 6 days).

Figure 5. Median hospitalization times (in days) in SARS-CoV-2 positive deceased patients



9. Deaths under the age of 50 years

As of November 25th 2020, 585 out of the 49,931 (1.2%) positive SARS-CoV-2 patients under the age of 50 died. In particular, 133 of these were less than 40 years (85 men and 48 women), age range between 0 and 39 years. For 34 patients under the age of 40 years no clinical information is available; out of the remaining ones, 85 had serious pre-existing pathologies (cardiovascular, renal, psychiatric pathologies, diabetes, obesity) and 14 had no major pathologies.

10. Comparison of death characteristics in the 3 quarters March-May, June-August, and September-November 2020

Table 4 summarizes the main characteristics of deaths with COVID-19 that occurred in 3 periods of time from the beginning of the pandemic in 2020: the initial quarter, March-May, the second quarter, June-August, and the third period September-November. Overall, the sample represents 11.4% of all deaths from the beginning of the pandemic; in particular, the 13.3% of those who died between March and May, 27.5% of those who died between June and August, and 5.4% of those who died between September and November.

In the second and third periods, the average age of deaths slightly increased (particularly in the second period) in comparison to the first period; the proportion of women increases in the second period only; deaths of people with 3 or more pre-existing pathologies increase and those of persons with fewer pathologies or none decrease: this seems to indicate that in the second and third period deaths concern older people and persons with a pre-existing health condition worse than those dying in the first quarter (table 4).

The use of drugs is also extremely different in the three periods, with a clear reduction in the use of antivirals and an increase in the use of steroids in the second and third periods.

Table 4. Mean age, prevalence of women, number of pre-existing diseases, complications and treatments in deaths with COVID-19 in the 3 periods March-May, June-August, and September-November 2020

All deaths	All (n=49,916) (Missing=15)	March-May 2020 (n=34,202)	June-August 2020 (n=1,420)	Sept-Nov 2020 (n=14,294)	<i>p</i> - value*
Age (years)	80.3	80.1	82.7	80.6	<0.001
	n (%)	n (%)	n (%)		
Women	21,028 (42.1)	14,323 (41.9)	879 (61.9)	5,826 (40.8)	<0.001
Sample of the evaluated clinical charts	All (n=5,592)	March-May 2020 (n=4,456)	June-August 2020 (n=385)	Sept-Nov 2020 (n=751)	<i>p</i> - value*
<i>N of comorbidities</i>					
0	178 (3.2)	169 (3.8)	3 (0.8)	6 (0.8)	<0.001
1	702 (12.6)	604 (13.6)	34 (8.8)	64 (8.5)	
2	1,036 (18.5)	890 (20.0)	51 (13.2)	95 (12.6)	
3 or more	3,676 (65.7)	2,793 (62.7)	297 (77.1)	586 (78.0)	
<i>Complications during hospitalization</i>					
Acute Respiratory Distress Syndrome	5,137 (94.0)	4,128 (95.2)	305 (80.1)	704 (94.4)	<0.001
Acute renal failure	1,287 (23.5)	998 (23.0)	105 (27.6)	184 (24.7)	0.099
Acute cardiac injury	597 (10.9)	470 (10.8)	41 (10.8)	86 (11.5)	0.850
Superinfection	1,053 (19.3)	719 (16.6)	178 (46.7)	156 (20.9)	<0.001
<i>Treatments</i>					
Antibiotics	4,742 (86.0)	3,801 (86.7)	324 (85.5)	617 (82.4)	0.007
Antivirals	2,818 (51.1)	2,593 (59.1)	132 (34.8)	93 (12.4)	<0.001
Steroids	2,701 (49.0)	1,895 (43.2)	231 (60.9)	575 (76.8)	<0.001
Tocilizumab	205 (4.1)	169 (4.3)	25 (6.8)	11 (1.4)	<0.001

* *p*-value for difference between the 3 quarters

The distribution of the main pre-existing diseases in the different periods is presented in *figure 6*. The prevalence of atrial fibrillation, heart failure, stroke, dementia, cancer and renal insufficiency varies significantly in the three periods. These pathologies are more frequently diagnosed in the deceased in the second and third period than in the first (*Figure 6*).

Figure 6. Pre-existing pathologies in deaths with COVID-19 in the 3 periods

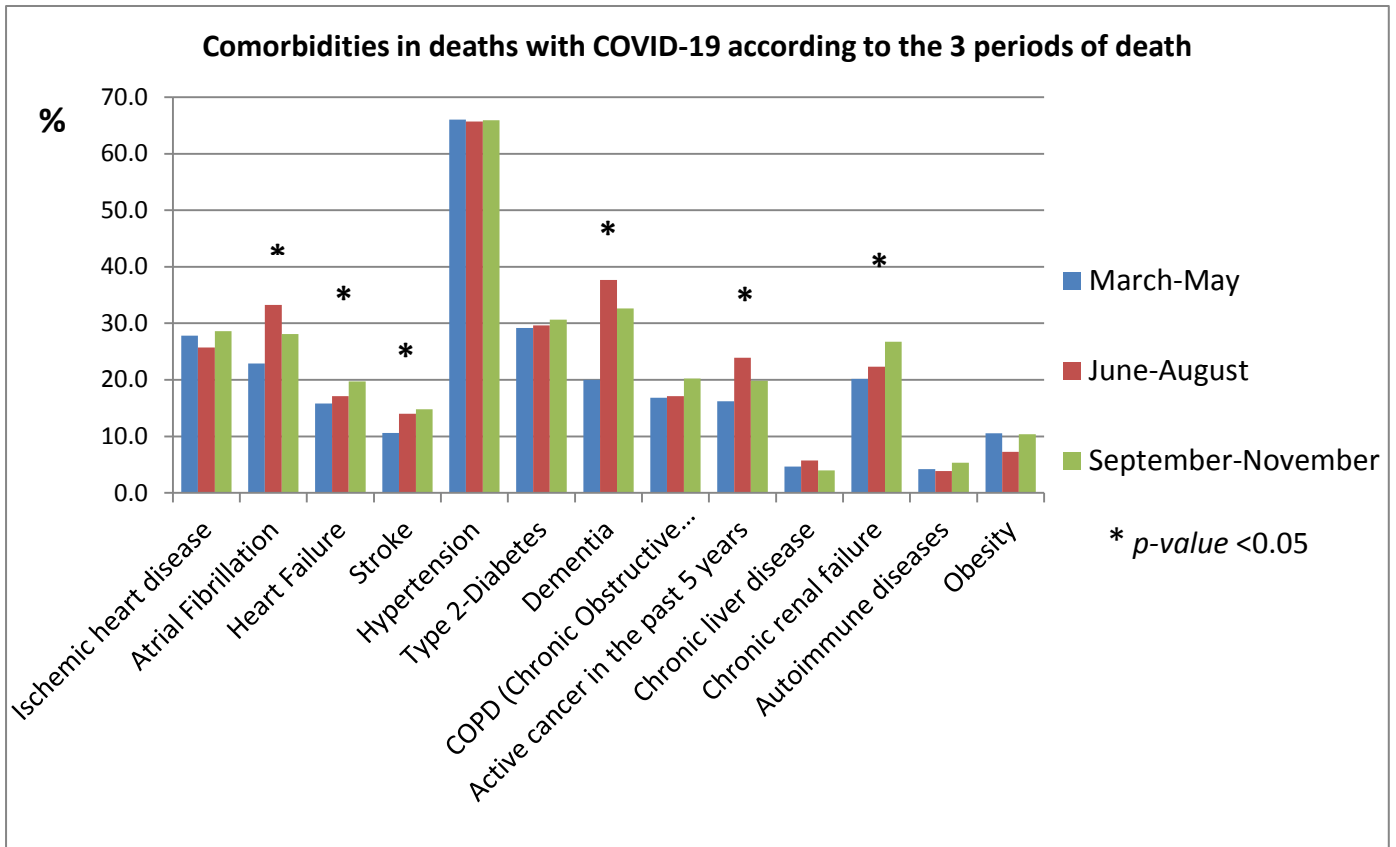


Table 5 shows the durations, as median times (in days), from the symptoms onset to death, SARS-CoV-2 testing, and hospitalization, and from the hospitalization to death, in the 3 periods considered. Between the first and second period triples the time that passes from the onset of symptoms to death, while it returns to the initial levels in the third period; decreases the time from the onset of symptoms to the swab for the detection of SARS-CoV-2 infection in both the second and third period, as well as the time between the onset of symptoms and hospitalization; the median duration in days from hospitalization to death between the first and second period triples; it decreases again in the third period, even if it remains above the levels of the first period. These results seem to suggest a greater reactivity of the Health System evidenced by the greater speed in carrying out diagnostic tests and hospitalization.

Table 5. Median times (in days) between symptoms onset, PCR test, hospitalization and death in the 3 periods

Times(in days)	All (n=5,592)		March-May 2020 (n=4,456)		June-August 2020 (n=385)		September- November 2020 (n=751)		p- value*
	Median	IQR	Median	IQR	Median	IQR	Median	IQR	
From symptoms onset to death	12	7-20	12	7-19	35	11-63	11	6-18	<0.001
From symptoms onset to SARS-CoV-2 testing	5	2-8	5	2-9	3	1-10	2	0-6	<0.001
From symptoms onset to hospitalization	4	2-7	4	2-7	3	1-7	3	1-6	<0.001
From hospitalization to death	7	3-14	7	3-13	21	5-50	7	3-13	<0.001

* p-value for difference between the 3 quarters

IQR=Inter-Quartile Range

The data here presented can be explained by a greater knowledge about the infection and a greater ability and timeliness of treatment in the period June-August in comparison to the previous quarter. In addition, it is likely that in the months of March and April SARS-CoV-2 infection was under-diagnosed in many frail elderly who died (such as those living in RSA). This may have led to an underestimation of the burden of the diseases in persons dying in that period

This report was produced by SARS-CoV-2 Surveillance Group

Members of the SARS-CoV-2 Surveillance Group

Luigi Palmieri, Elvira Agazio, Xanthi Andrianou, Pierfrancesco Barbariol, Antonino Bella, Stefania Bellino, Eva Benelli, Luigi Bertinato, Matilde Bocci, Stefano Boros, Gianfranco Brambilla, Giovanni Calcagnini, Marco Canevelli, Maria Rita Castrucci, Federica Censi, Alessandra Ciervo, Elisa Colaizzo, Fortunato D'Ancona, Martina Del Manso, Corrado Di Benedetto, Chiara Donfrancesco, Massimo Fabiani, Francesco Facchiano, Antonietta Filia, Marco Florida, Fabio Galati, Marina Giuliano, Tiziana Grisetti, Cecilia Guastadisegni, Yllka Kodra; Martin Langer, Iliara Lega, Cinzia Lo Noce, Pietro Maiozzi, Fiorella Malchiodi Albedi, Valerio Manno, Margherita Martini, Alberto Mateo Urdiales, Eugenio Mattei, Claudia Meduri, Paola Meli, Giada Minelli, Manuela Nebuloni, Lorenza Nisticò, Marino Nonis, Graziano Onder, Lucia Palmisano, Nicola Petrosillo, Patrizio Pezzotti, Flavia Pricci, Ornella Punzo, Vincenzo Puro, Federica Quarata, Valeria Raparelli, Giovanni Rezza, Flavia Riccardo, Simone Rocchetto, Maria Cristina Rota, Paolo Salerno, Giulia Sarti, Debora Serra, Andrea Siddu, Paola Stefanelli, Manuela Tamburo De Bella, Dorina Tiple, Marco Toccaceli Blasi, Federica Trentin, Brigid Unim, Luana Vaianella, Nicola Vanacore, Maria Fenicia Vescio, Monica Vichi, Emanuele Rocco Villani, Amerigo Zona, Silvio Brusafferro.