High Mortality Rate Among Latin American Immigrants With Covid-19 Hospitalised in Milan, Italy: Data From the Luigi Sacco Hospital Registry

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Abstract

Background

To assess differences in the probability of COVID-19-related death between native Italians and immigrants hospitalised with COVID-19.

Methods

This was a retrospective study of prospectively collected data conducted at the ASST Fatebenefratelli-Sacco Hospital in Milan, Italy, between 21 February and 31 November 2020. Uni- and multivariable Cox proportional hazard models were used to assess the impact of the patients' origin on the probability of COVID-19-related death.

Results

The study population consisted of 1,179 COVID-19 patients: 921 Italians (78.1%) and 258 immigrants (21.9%) from Latin America (99, 38.4%), Asia (72, 27.9%), Africa (50, 19.4%) and central/eastern Europe (37, 14.3%). The Italians were older ($p < 0.001$) and more frequently affected by co-morbidities ($p < 0.001$). Mortality was significantly greater among the Italians than the immigrants as a whole (26.6% vs 12.8%; $p < 0.001$), and significantly greater among the immigrants from Latin America than among those from Asia, Africa and central/eastern Europe (21.2% vs 8.3%, 6% and 8.1%, respectively; $p = 0.016$). Multivariate analyses showed that a Latin American origin was independently associated with an increased risk of death (adjusted hazard ratio 1.95, 95% confidence interval 1.17–3.23).

Conclusions

Our findings support the need to strengthen COVID-19 information and prevention initiatives in the Latin American community living in Milan.

1.0 Background

The COVID-19 pandemic caused by the newly identified coronavirus SARS-CoV-2 started to hit Europe in late February 2020, when there was an abrupt surge of severely and critically ill respiratory patients in northern Italy, particularly Lombardy [1]. From then to week 16 of 2021, 30,290,698 cases and 678,653 deaths were reported in the EU/EEA, many of which occurred in Italy [2].

The probability that people infected with SARS-CoV-2 will die is one of the most concerning aspects of the COVID-19 pandemic. Early observational studies of hospitalised COVID-19 patients found that an older age, a higher co-morbidity burden, obesity, and disease severity upon hospital admission all

markedly influenced the risk of death [3]. Furthermore, data from ongoing studies of the general population spread of the virus [4] suggest that a higher risk of exposure is associated with socio-economic vulnerabilities, such as limited educational and employment opportunities and/or belonging to an ethnic minority, and that people in poorer general health are more likely to develop severe and fatal illness [5–8]. It has also been observed that immigrants are at greater risk of exposure and infection than native populations, probably because they often work in high-risk occupations, live in overcrowded accommodation, and face barriers to healthcare and prevention initiatives [9, 10]. Some studies have found that immigrants with COVID-19 are also at increased risk of hospitalisation [9, 10], but it is unclear whether this means that they are also at increased risk of COVID-19-related death [11, 12].

The aim of this study was to assess differences in the probability of COVID-19-related death between native Italians and immigrants with COVID-19 admitted to two major hospitals in Milan, Italy.

2.0 Materials And Methods

2.1 Study design

This was a retrospective observational study of prospectively collected data relating to a cohort of hospitalised COVID-19 patients.

2.2 Setting

The study was conducted at the Department of Infectious Diseases and intensive care unit of Luigi Sacco Hospital in collaboration with the Department of Internal Medicine of Fatebenefratelli Hospital. Luigi Sacco Hospital, which is located on the outskirts of Milan, is one of the city's major infectious diseases centres, and has been at the forefront of the hospitalisation of COVID-19 patients since the first days of the pandemic in Italy [13–16]. The Department of Internal Medicine of Fatebenefratelli Hospital, which is located in the inner city, was rapidly converted to a COVID-19 centre when the pandemic struck.

As laid down in Italian healthcare regulations, urgent and essential healthcare is provided free of charge to Italians and immigrants regardless of their legal status.

2.3 Participants

The study enrolled all of the adult patients with a diagnosis of COVID-19 confirmed by reverse-transcriptase polymerase chain reaction on a nasopharyngeal swab who were admitted to our hospitals between 21 February and 31 November 2020; observation of the cohort was censored on 28 February 2021.

2.4 Data source and management

The full characteristics of data management have been described elsewhere [13–16]. In brief, the data were extracted from the patients' clinical charts on a daily basis, and were stored in an *ad hoc* database. The collected data were the patients' date and place of birth, and biological sex; the time between

symptom onset and hospital admission; co-morbidities (including diabetes, lung diseases, heart diseases, renal diseases, immune system diseases, liver diseases, and obesity defined as a body mass index of ≥ 30) [17]; the burden of co-morbidities (0, 1, 2, and 3+); whether there was a need for supportive oxygen therapy upon hospital admission; disease severity upon hospital admission (defined as mild, moderate, severe or critical in accordance with the WHO guidelines for the management of COVID-19) [13, 18]; and hospitalisation outcome (date and cause of death, discharge or transfer to other facilities). The vital status of the patients who were discharged or transferred before the censoring date was ascertained by means of telephone calls.

2.5 Outcomes and variables

The main outcome of interest was COVID-19-related death, and the principal variable of interest was place of birth. The patients were classified as natives (if they were born in Italy) or immigrants (subdivided into four regions of origin: central/eastern Europe, Africa, Latin America, and Asia).

Baseline variables known to be clinically relevant to the outcome of interest [3, 13, 14] and included in the analysis as potential confounders were age, sex, the number of days between symptom onset and hospital admission, co-morbidities (including obesity), and disease severity upon hospital admission.

2.6 Statistical analysis

The descriptive statistics of the categorical variables are given as proportions, and those of the continuous variables as median values and interquartile range (IQR). The baseline demographic and clinico-epidemiological characteristics of the Italians and immigrants were compared using the χ^2 or Fisher's exact test for the categorical variables, and Wilcoxon's rank-sum test for the continuous variables; the characteristics of the immigrants from different regions of origin were also compared in the same way.

The Kaplan-Meier method was used to plot the survival curves of the patients from the different regions, and age-adjusted survival curves were generated using Cox's model. The association between the patients' origins and the risk of COVID-19-related death was investigated using uni- and multivariable Cox proportional hazard ratios (HRs) and their 95% confidence intervals (CIs).

All of the statistical analyses were made using SAS software, version 9.4, and differences with a *P* value of < 0.05 were considered statistically significant.

The study was approved by our Ethics Committee (Comitato Etico Interaziendale Area 1, Milan, Italy). All patients signed a written informed consent except those on mechanical ventilation upon admission from whom was waived according to the Ethics Committee (Comitato Etico Interaziendale Area 1, Milan, Italy).

3.0 Results

Between 21 February and 31 November 2020, our clinical centres admitted 1,179 COVID-19 patients: 921 Italians (78.1%) and 258 immigrants (21.9%). Figure 1 shows monthly enrolment during the study period:

there was no difference in the proportion of immigrants enrolled during the first (21 February-30 April) and second wave of the pandemic (1 October-31 November).

Table 1 shows the patients' baseline demographic and clinical characteristics. The Italians were significantly older than the immigrants (median age 70 years [IQR 58–79] *vs* 51 years [IQR 41–60]; $p < 0.001$) and more frequently had one or more co-morbidities (79.1% *vs* 53.9%; $p < 0.001$), particularly cardiovascular (60.6% *vs* 29.5%) and oncological diseases (14.5% *vs* 6.6%) ($p < 0.001$ for both). The time between the onset of COVID-19 symptoms and hospital admission was shorter among the immigrants (6 [IQR 3–9] *vs* 7 days [IQR 3–19]; $p = 0.026$), but there was no between-group difference in disease severity upon hospital admission.

Table 1
Characteristics of the study population by origin.

	Overall n = 1179	Non- Italians n = 258	Italians n = 921	p- value
Median age [IQR]	65 [53, 76]	51 [41, 60]	70 [58, 79]	< 0.001
Age ≥ 65 years, n (%)	585 (49.6)	40 (15.5)	545 (59.2)	< 0.001
Biological sex				
Female, n (%)	400 (33.9)	86 (33.3)	314 (34.1)	0.882
Male, n (%)	779 (66.1)	172 (66.7)	607 (65.9)	
Co-morbidities				
Obesity*, n (%)	231 (19.6)	60 (23.3)	171 (18.6)	0.110
Diabetes, n (%)	166 (14.1)	32 (12.4)	134 (14.5)	0.419
Lung diseases, n (%)	199 (16.9)	29 (11.2)	170 (18.5)	0.006
Heart diseases, n (%)	634 (53.8)	76 (29.5)	558 (60.6)	< 0.001
Renal diseases, n (%)	116 (9.8)	22 (8.5)	94 (10.2)	0.479
Oncological diseases, n (%)	151 (12.8)	17 (6.6)	134 (14.5)	< 0.001
Immune system diseases, n (%)	90 (7.6)	19 (7.4)	71 (7.7)	0.999
Liver diseases, n (%)	38 (3.2)	13 (5.0)	25 (2.7)	0.072
Number of co-morbidities				

IQR: interquartile range.

*Obesity defined as a body mass index of ≥ 30 [15].

†WHO disease severity classification [16]: mild = mild clinical symptoms, no imaging signs of pneumonia; moderate = fever, cough, dyspnea or other symptoms, imaging signs of pneumonia; severe = any of respiratory distress with a respiratory rate (RR) of ≥ 30 breaths per minute; resting oxygen saturation in air ≤ 93 %; PaO₂ / FiO₂ ≤ 300 mmHg); critical = any of respiratory failure requiring mechanical ventilation; shock; any other organ failure needing intensive care.

	Overall n = 1179	Non-Italians n = 258	Italians n = 921	p-value
0	311 (26.4)	119 (46.1)	192 (20.8)	<i>< 0.001</i>
1	377 (32.0)	68 (26.4)	309 (33.6)	
2	304 (25.8)	41 (15.9)	263 (28.6)	
3+	187 (15.9)	30 (11.6)	157 (17.0)	
Median number of days from symptom onset [IQR]	7 [3, 10]	6.00 [3, 9]	7 [3, 10]	<i>0.026</i>
Disease severity upon hospital admission [†]				
Mild	113 (9.6)	31 (12.0)	82 (8.9)	0.242
Moderate	487 (41.3)	113 (43.8)	374 (40.6)	
Severe	279 (23.7)	54 (20.9)	225 (24.4)	
Critical	300 (25.4)	60 (23.3)	240 (26.1)	
IQR: interquartile range.				
*Obesity defined as a body mass index of ≥ 30 [15].				
†WHO disease severity classification [16]: mild = mild clinical symptoms, no imaging signs of pneumonia; moderate = fever, cough, dyspnea or other symptoms, imaging signs of pneumonia; severe = any of respiratory distress with a respiratory rate (RR) of ≥ 30 breaths per minute; resting oxygen saturation in air $\leq 93\%$; PaO ₂ / FiO ₂ ≤ 300 mmHg; critical = any of respiratory failure requiring mechanical ventilation; shock; any other organ failure needing intensive care.				

Ninety-nine of the immigrants (38.4%) came from Latin America (mainly from Peru, Ecuador, and El Salvador); 72 (27.9%) from Asia (mainly from The Philippines, Bangladesh, and China); 50 (19.4%) from Africa (mainly from Egypt and Morocco); and 37 (14.3%) from central/eastern Europe (mainly Ukraine, Albania, and Romania). Table 2 shows the differences in the demographic and clinical characteristics of the immigrants by region of origin. The patients from central/eastern Europe included more women (51.4%) than the other groups ($p = 0.015$). The patients from Latin America were characterised by a non-statistically significant higher prevalence of obesity, a longer time interval between symptom onset and hospital admission than the other non-Italians ($p = 0.015$), and less frequent diagnoses of mild disease upon admission ($p = 0.011$).

Table 2
Characteristics of non-Italian patients with COVID-19 by origin.

	Latin Americans n = 99	Asians n = 72	Africans n = 50	Central/eastern Europeans n = 37	p- value
Median age [IQR]	50 [42, 58]	51 [36, 59]	53 [41, 63]	54 [46, 63]	0.128
Biological sex					
Female, n (%)	37 (37.4)	17 (23.6)	13 (26.0)	19 (51.4)	0.015
Male, n (%)	62 (62.6)	55 (76.4)	37 (74.0)	18 (48.6)	
Co-morbidities					
Obesity*, n (%)	31 (31.3)	10 (13.9)	10 (20.0)	9 (24.3)	0.059
Diabetes, n (%)	11 (11.1)	9 (12.5)	8 (16.0)	4 (10.8)	0.841
Lung diseases, n (%)	13 (13.1)	6 (8.3)	8 (16.0)	2 (5.4)	0.339
Heart diseases, n (%)	20 (20.2)	24 (33.3)	19 (38.0)	13 (35.1)	0.074
Renal diseases, n (%)	8 (8.1)	9 (12.5)	3 (6.0)	2 (5.4)	0.502
Oncological diseases, n (%)	8 (8.1)	5 (6.9)	2 (4.0)	2 (5.4)	0.801
Immune system diseases, n (%)	10 (10.1)	1 (1.4)	4 (8.0)	4 (10.8)	0.137
Liver diseases, n (%)	6 (6.1)	3 (4.2)	2 (4.0)	2 (5.4)	0.929
Number of co-morbidities					
0	46 (46.5)	34 (47.2)	22 (44.0)	17 (45.9)	0.992
1	26 (26.3)	19 (26.4)	14 (28.0)	9 (24.3)	
IQR, Inter Quartile Range.					
* Obesity defined as a body mass index of 30 [15].					
† WHO disease severity classification [16]: mild = mild clinical symptoms, no imaging signs of pneumonia; moderate = fever, cough, dyspnoea or other symptoms, imaging signs of pneumonia; severe = any of respiratory distress with a respiratory rate (RR) of ≥ 30 breaths per minute; resting oxygen saturation in air $\leq 93\%$; $\text{PaO}_2 / \text{FiO}_2 \leq 300$ mmHg); critical = any of respiratory failure requiring mechanical ventilation; shock; any other organ failure needing intensive care.					

	Latin Americans n = 99	Asians n = 72	Africans n = 50	Central/eastern Europeans n = 37	p- value
2	16 (16.2)	10 (13.9)	7 (14.0)	8 (21.6)	
3+	11 (11.1)	9 (12.5)	7 (14.0)	3 (8.1)	
Median number of days from symptom onset [IQR]	7 [4, 10]	6 [2, 8]	4 [2, 8]	5 [3, 7]	<i>0.015</i>
Disease severity upon hospital admission[†]					
Mild	5 (5.1)	10 (13.9)	9 (18.0)	7 (18.9)	<i>0.011</i>
Moderate	39 (39.4)	33 (45.8)	27 (54.0)	14 (37.8)	
Severe	30 (30.3)	8 (11.1)	7 (14.0)	9 (24.3)	
Critical	25 (25.3)	21 (29.2)	7 (14.0)	7 (18.9)	
IQR, Inter Quartile Range.					
* Obesity defined as a body mass index of 30 [15].					
† WHO disease severity classification [16]: mild = mild clinical symptoms, no imaging signs of pneumonia; moderate = fever, cough, dyspnoea or other symptoms, imaging signs of pneumonia; severe = any of respiratory distress with a respiratory rate (RR) of ≥ 30 breaths per minute; resting oxygen saturation in air $\leq 93\%$; $\text{PaO}_2 / \text{FiO}_2 \leq 300$ mmHg); critical = any of respiratory failure requiring mechanical ventilation; shock; any other organ failure needing intensive care.					

3.1 COVID-19-related mortality

Two hundred and seventy-eight of the 1,179 (23.5%) patients died in hospital within a median of 12 (6–20) days after admission. The mortality rate was higher among the Italians (245/921, 26.6%) than among the immigrants as a whole (33/258, 12.8%) ($p < 0.001$), and higher among the immigrants from Latin America (21.2%) than among those from Asia (8.3%), central-eastern Europe (8.1%) or Africa (6%) ($p = 0.016$).

Figures 2A and 2B show the Kaplan-Meier and age-adjusted survival curves of the patients by region of origin. The overall probability of COVID-19-related death within 30 days of hospital admission was

highest among the Italians (24%, 95 CI: 21–27%) followed by the Latin Americans (17%, 95 CI: 10–25%) but, after adjusting for age, the highest 30-day mortality rate was among the Latin Americans.

3.2 Uni- and multivariable Cox proportional hazard models of the association between the immigrants' region of origin and their risk of COVID-19-related death

Univariable Cox proportional hazard analysis showed that the risk of COVID-19-related death among the immigrants from Africa (0.20, 95% CI 0.00-0.63), Asia (0.28, 95% CI 0.00-0.63), and central/eastern Europe (0.27, 95% CI 0.00-0.84) was lower than that of the Italians whose risk did not significantly differ from that of Latin Americans (0.74, 95% CI 0.47–1.15) (Table 3).

Table 3

Cox regression analysis of the demographic and clinical factors associated with mortality due to SARS-CoV-2 infection.

	HR	95% CI	p-value	AHR	95% CI	p-value
Age (per 1 year more)	1.05	1.04–1.06	< 0.0001	1.07	1.06–1.08	< 0.0001
Males vs females	1.17	0.90–1.50	0.234	1.46	1.12–1.92	0.006
Time from symptom onset (per 1 day more)	0.99	0.98–1.02	0.823	0.99	0.97–1.01	0.408
African vs Italian origin	0.20	0.00–0.63	0.006	0.51	0.16–1.61	0.248
Asian vs Italian origin	0.28	0.00–0.63	0.002	0.68	0.30–1.54	0.354
Central/eastern Europe vs Italian origin	0.27	0.00–0.84	0.024	0.66	0.21–2.07	0.475
Latin American vs Italian origin	0.74	0.47–1.15	0.183	1.95	1.17–3.23	0.010
Obesity* yes vs no	1.38	1.05–1.81	0.021	1.64	1.23–2.20	0.001
Moderate vs mild COVID-19 [†]	2.29	1.11–4.75	0.026	2.03	0.97–4.24	0.059
Severe vs mild COVID-19 [†]	3.98	1.92–8.29	0.0001	3.76	1.78–7.93	0.001
Critical vs mild COVID-19 [†]	7.56	3.70–15.46	< 0.0001	8.52	4.09–17.76	< 0.0001
HR: hazard ratio; CI: confidence interval.						
* Obesity defined as body mass index of ≥ 30 points [15].						
† WHO disease severity classification [16]: mild = mild clinical symptoms, no imaging signs of pneumonia; moderate = fever, cough, dyspnea or other symptoms, imaging signs of pneumonia; severe = any of respiratory distress with a respiratory rate (RR) of ≥ 30 breaths per minute; resting oxygen saturation in air $\leq 93\%$; $\text{PaO}_2 / \text{FiO}_2 \leq 300$ mmHg); critical = any of respiratory failure requiring mechanical ventilation; shock; any other organ failure needing intensive care..						

However, multivariable analysis adjusted for confounders showed that being a Latin American immigrant was independently associated with an increased risk of COVID-19-related death (adjusted HR [aHR] vs Italians 1.95, 95% CI 1.17–3.23), and confirmed that age (aHR 1.07 per 1 year more, 95% CI 1.06–1.08), male sex (aHR: 1.46, 95% CI 1.12–1.92), obesity (aHR: 1.64, 95% CI 1.23–2.20), and disease severity

upon hospital admission (severe disease: aHR 3.76, 95% CI 1.78–7.93; critical disease: aHR 8.52, 95% CI 4.09–17.76) were all independently associated with a higher risk of COVID-19-related death.

4.0 Discussion

Just over 20% of our hospitalised COVID-19 patients were immigrants and, excluding the early days of the study period (when the patients were mainly Italians from the first epidemic hotspots in Lombardy) [1, 13], the percentage was similar during the first and second waves of the epidemic in early spring and autumn 2020. This is slightly higher than the percentage of immigrants living in the metropolitan area of Milan (14.1%) or in the inner-city (18.2%) [19], and included a much higher proportion of Latin Americans (38.4%) than the proportion of Latin Americans in the city's immigrant population as a whole (16.5%) [20]. This suggests a greater spread of SARS-CoV-2 infection among Latin Americans than in the other immigrant communities.

The immigrants in our cohort were significantly younger and less frequently affected by age-related co-morbidities than the Italians, which reflects the demographic differences between the two groups in northern Italy [21]. An older age and age-related co-morbidities are known to be associated with COVID-19-related mortality [3, 13, 14], and so it is not surprising that in-hospital mortality was greater among the Italians than among the immigrants as a whole. However, it was worryingly unexpected to find that, after adjusting for age, gender, and baseline clinical characteristics, Latin Americans were at higher risk of dying than the immigrants from other regions.

The findings of two previous studies of Spanish and immigrant COVID-19 patients hospitalised in Spain (including a majority of immigrants from Latin America) are different: one did not find any significant difference in mortality between patients of European and non-European origin [12], and the other found that mortality was actually lower among the immigrants [11]. The foreign-born patients in these studies had similar demographic characteristics to those of our immigrant patients, but the lack of additional information concerning the clinical drivers of COVID-19 outcomes (such disease severity or the prevalence of obesity) makes it difficult to make a more detailed comparison. It is also worth remembering that, although Italy and Spain are the main European destinations of Latin American migrants [22], it is likely that those settling in Spain are more integrated, not least because of their common language and cultural proximity.

It is possible that the Latin Americans in our study experienced severe/critical disease more frequently than immigrants from other regions because they knew less about or underestimated the early signs of COVID-19 and were therefore less likely to seek medical advice promptly, or they may have been afraid of losing wages or their often precarious and unregistered jobs. These factors were found to be common in a qualitative study of Latin Americans with COVID-19 hospitalised in San Francisco [23], and may explain the excess burden of morbidity and mortality among Latin Americans in the USA, particularly in more recent immigrants [24, 25].

Government policies limiting the access of uninsured or undocumented immigrants to healthcare services can also affect the care seeking behaviour of immigrants and, although Italy guarantees free emergency healthcare regardless of legal status, undocumented immigrants are highly vulnerable and may be unaware of their rights [26].

Another striking characteristic of our Latin American patients is the high (30%) prevalence of obesity, which substantially increases the risk of COVID-related death [13, 14]. The rates of obesity have markedly increased in Latin America over the last 10–15 years, and it is now considered a public health problem in most countries [27–29]. In addition, there is evidence that the change in dietary habits associated with immigration and integration increases susceptibility to obesity [28].

The greater frequency of severe COVID-19 and disease-related mortality among the Latin American immigrants hospitalised in two clinical centres in Milan is alarming, and there is a real need to clarify if it is due to a higher incidence of SARS-CoV-2 infection in the Latin American community, or to cultural, behavioural and socio-economic reasons preventing them from promptly seeking healthcare, or to other factors that have not yet been identified.

Study limitations

This study has a number of limitations. First of all, its design means that our findings may not apply to different settings and, although the study centres were located in different parts of Milan, it is possible that the study population did not reflect the demographics of the entire metropolitan area. Secondly, the relatively small number of immigrants in our cohort may have limited our characterisation of the differences between groups of immigrants of different origin. Finally, we were unable to collect data regarding the patients' education level or health literacy, their occupations, the length of time they had been in Italy, or their legal status, all of which would have allowed a more precise analysis of the possible association between socio-economic factors and COVID-19 outcomes.

Conclusions

Our finding that Latin Americans with COVID-19 hospitalised in Milan are at higher risk of death than other immigrants strongly suggests a need for more tailored prevention initiatives, including more information about the manifestations of COVID-19, the testing process, when and where to seek care, and the available vaccinations. It is also important to continue research into the factors that play a role in the disparities of COVID-19-related morbidity and mortality in specific populations affected by socio-economic inequalities.

Declarations

Ethics approval and consent to participate in the study

The study was approved by our Ethics Committee (Comitato Etico Interaziendale Area 1, Milan, Italy). All patients signed a written informed consent except those on mechanical ventilation upon admission from whom was waived according to the Ethics Committee (Comitato Etico Interaziendale Area 1, Milan, Italy).

Consent to publication

Not required

Availability of data and materials

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Competing interests

None related to the present manuscript. AG has received consultancy fees from Mylan, and non-financial educational support and a research grant from Gilead. MG received grants, fees for speaker's bureau, advisory boards and CME activities from BMS, ViiV, MSD, AbbVie, Gilead, Janssen and Roche. GR received grants, fees for speaker's bureau, advisory boards and CME activities from BMS, ViiV, MSD, AbbVie, Gilead, Janssen and Roche. SA received support for research activities from Pfizer and Merck Sharp & Dome. All other authors have nothing to declare.

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None.

Authors' contributions

ALR and AG designed the study; LO and AG were responsible for the statistical analysis. All of the authors contributed to data collection and interpretation. AG prepared a preliminary draft of the manuscript, which was critically reviewed by ALR and SA. All of the authors approved the final version of the paper.

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Figures

Figure 1

Number of hospital admissions to the Department of Infectious Diseases and intensive care unit of Luigi Sacco Hospital by patient origin. * The percentage of immigrants admitted during the first and second waves ** The proportion of immigrants hospitalised during the first and second waves was compared using the χ^2 test

Figure 2

A) Kaplan-Meier survival curves by patient origin. B) Age-adjusted survival curves generated by means of a Cox model.