

COVID-19 mortality among migrants living in Italy

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Abstract

We aimed to compare COVID-19-specific and all-cause mortality rates among natives and migrants in Italy and to investigate the clinical characteristics of individuals dying with COVID-19 by native/migrant status. The mortality rates and detailed clinical characteristics of natives and migrants dying with COVID-19 were explored by considering the medical charts of a representative sample of patients deceased in Italian hospitals ($n = 2,687$) between February 21st and April 29th, 2020. The migrant or native status was assigned based on the individual's country of birth. The expected all-cause mortality among natives and migrants living in Italy was derived by the last available (2018) dataset provided by the Italian National Institute of Statistics. Overall, 68 individuals with a migration background were identified. The proportions of natives and migrants among the COVID-19-related deaths (97.5% and 2.5%, respectively) were similar to the relative all-cause mortality rates estimated in Italy in 2018 (97.4% and 2.6%, respectively). The clinical phenotype of migrants dying with COVID-19 was similar to that of natives except for the younger age at death. International migrants living in Italy do not have a mortality advantage for COVID-19 and are exposed to the risk of poor outcomes as their native counterparts.

Key words

- COVID-19
- migration
- SARS-CoV-2
- global health

INTRODUCTION

International migrants (i.e., people living outside their country of birth) have repeatedly been shown to have a mortality advantage, defined as lower mortality relative to native populations in high-income host countries [1, 2]. This apparently paradoxical epidemiological pattern can be explained by several factors. The “healthy migrant” hypothesis consists of the selection of healthy and robust individuals that are more likely to decide to migrate and benefit from migration [1]. The “salmon bias” reflects the common behavior of migrants generally returning to their countries of origin when they are in poor health or before death [1]. Finally, different ages, lifestyles, health-related behaviors, social networks, and accessibility to health-

care resources have been proposed as contributing factors [3].

Nevertheless, the mortality advantage in migrants, observed for the majority of non-communicable diseases, does not apply to infectious diseases [1, 4]. To date, no studies have specifically explored the mortality impact of the ongoing COVID-19 pandemic in international migrant populations. Addressing this issue has important public health implications since 272 million international migrants are estimated worldwide [5].

The present study aimed at evaluating whether the current rate of COVID-19-related deaths differs from the expected mortality rate for migrants and at assessing the clinical characteristics of migrants deceased with COVID-19 in Italy as compared with natives.

METHODS

At the outset of the COVID-19 outbreak, the Italian National Institute of Health (Istituto Superiore di Sanità, ISS) launched an integrated national surveillance system to collect information on all individuals with COVID-19 throughout the country [6]. All deaths occurring in patients with confirmed COVID-19 were tracked by the surveillance system. COVID-19-related deaths were defined as those occurring in patients who tested positive for SARS-CoV-2 through RT-PCR, independently from pre-existing diseases that may have caused or contributed to death.

In the present analysis, mortality rates and the detailed clinical characteristics of natives and migrants dying with COVID-19 were explored by considering the medical charts of a sample of patients deceased in Italian hospitals between February 21st and April 29th, 2020, representative in terms of age, sex, and geographical distribution of overall COVID-19-related deaths occurred in the country [7]. Specifically, 2,687 medical charts consecutively collected from the Italian regions and autonomous provinces were centrally analyzed. The migrant or native status was assigned based on the individual's country of birth [1], as indicated on the chart and/or on the tax/fiscal code. People born abroad have their four-character code according to the country of birth, all of them beginning with letter Z (e.g., Albania is identified by the code Z100). The following data were extracted from the charts: demographics; comorbidities; symptoms at onset; in-hospital complications; treatments received; admission to intensive care unit; time from onset to hospitalization, SARS-CoV-2 testing, and death; time from hospitalization to death.

The expected all-cause mortality among natives and migrants living in Italy was derived by the 2018 data provided by the Italian National Institute of Statistics (ISTAT) (http://dati.istat.it/Index.aspx?DataSetCode=DCIS_MORTALITA1#). World countries were categorized according to the ISTAT classification in: i) Highly developed countries (European countries except those of Central-Eastern Europe, North America, Israel, Japan,

and Oceania); ii) European countries with High Migratory Pressure (Central and Eastern Europe); iii) Non-European countries with High Migratory Pressure (Africa, Asia, Central and South America).

The Kolmogorov-Smirnov and Shapiro-Wilk tests were used to verify the normal distribution of continuous variables. The characteristics of natives and migrants were compared by means of ANOVA analyses for normally distributed variables, non-parametric Mann-Whitney U-test for skewed variables, and Fisher's exact test for categorical variables.

This study was performed in line with the principles of the Declaration of Helsinki. On February 27th, 2020, the Italian Presidency of the Council of Ministers authorized the collection and scientific dissemination of data concerning the COVID-19 epidemics by the ISS and other public health institutions [8].

RESULTS

Overall, 68 individuals (39.7% women) with a migration background were identified in the study population. The most common countries of birth of migrants were Albania (n = 15) and France (n = 8) (Table 1). The proportions of natives and migrants among the COVID-19-related deaths (97.5% and 2.5%, respectively) were similar to the relative all-cause mortality rates estimated in Italy in 2018 (97.4% and 2.6%, respectively) (Table 1). Accordingly, migrants' mortality distribution in the three categories of countries of origin did not substantially differ from what was expected based on the 2018 national data (Table 1).

Migrants were younger at the time of death compared to natives (71.1, SD 13.1 years vs 78.3, SD 10.8 years; $p < 0.001$) (Table 2); no statistically significant differences were found for age at death according to the profile of migrants' countries of birth ($p = 0.30$). A lower prevalence of ischemic heart disease and hypertension was documented among migrants relative to natives (17.5% vs 28.7%, $p = 0.03$, and 55.6% vs 68.5, $p = 0.02$, respectively) (Table 2). No other significant differences were observed between groups for comorbidities, sex distribution, symptoms at onset, treatments

Table 1

Expected all-cause deaths and observed COVID-19 related deaths in natives and migrants living in Italy

	All-cause deaths*		COVID-19 related deaths		
	n	%	n	%	95% CI
Natives	616,729	97.4	2,619	97.5	96.8-98.0
Migrants	16,402	2.6	68	2.5	2.0-3.2
Highly developed countries	5,203	0.8	15	0.6	0.3-0.9
European HMP countries	2,362	0.4	25	0.9	0.6-1.4
Non-European HMP countries	8,837	1.4	28	1.0	0.7-1.5
Total	633,131	100	2,687	100	

*2018 ISTAT data (http://dati.istat.it/Index.aspx?DataSetCode=DCIS_MORTALITA1#)

Migrants are grouped according to the ISTAT classification of world countries: i) Highly developed countries (European countries except those of Central-Eastern Europe, North America, Israel, Japan, and Oceania); ii) European countries with High Migratory Pressure (Central and Eastern Europe); iii) Non-European countries with High Migratory Pressure (Africa, Asia, Central and South America).

Migrants' countries of birth: Albania (n = 15); France (n = 8); India (n = 4); Libya (n = 3); Romania (n = 3); Switzerland (n = 3); Tunisia (n = 3); Ukraine (n = 3); Ethiopia (n = 2); Morocco (n = 2); Philippines (n = 2); Algeria (n = 1); Argentina (n = 1); Austria (n = 1); Belgium (n = 1); Bulgaria (n = 1); Dominican Republic (n = 1); Ecuador (n = 1); Egypt (n = 1); Germany (n = 1); Ghana (n = 1); Honduras (n = 1); Macedonia (n = 1); Paraguay (n = 1); Peru (n = 1); Russia (n = 1); Serbia-Montenegro (n = 1); Somalia (n = 1); Sudan (n = 1); United States of America (n = 1); Uruguay (n = 1).

Table 2
 Characteristics of individuals deceased with COVID-19 in Italy by migration status

	Natives (n = 2,619)	Migrants (n = 68)	p-value
Demographics			
Age	78.3 ± 10.8	71.1 ± 13.1	< 0.001
Female sex	853 (32.6)	27 (39.7)	0.24
Comorbidities			
Ischemic heart disease	734 (28.7)	11 (17.5)	0.03
Atrial fibrillation	570 (22.3)	14 (22.2)	0.57
Heart failure	417 (15.9)	10 (14.7)	0.55
Stroke	271 (10.6)	5 (7.9)	0.33
Hypertension	1,753 (68.5)	35 (55.6)	0.02
Type 2 diabetes	790 (30.9)	24 (38.1)	0.14
Dementia	407 (15.9)	8 (12.7)	0.31
Chronic obstructive pulmonary disease	423 (16.5)	12 (19.0)	0.35
Active cancer (last 5 years)	408 (15.9)	11 (17.5)	0.43
Chronic liver disease	101 (3.9)	3 (4.8)	0.46
Chronic renal failure	522 (20.4)	11 (17.5)	0.35
HIV	6 (0.2)	0 (0.0)	0.86
Autoimmune disease	96 (3.8)	5 (7.9)	0.09
Obesity	282 (11.0)	6 (9.5)	0.45
Number of comorbidities			
0	98 (3.8)	2 (5.1)	0.79
1	381 (14.9)	4 (10.3)	
2	546 (21.3)	9 (23.1)	
≥ 3	1,533 (59.9)	24 (61.5)	
Symptoms			
Fever	1,928 (76.2)	52 (80.0)	0.56
Dyspnea	1,861 (73.5)	43 (66.2)	0.20
Cough	974 (38.5)	22 (33.8)	0.52
Diarrhea	144 (5.7)	2 (3.1)	0.58
Hemoptysis	15 (0.6)	0 (0.0)	1.00
Treatments			
Antibiotics	2,138 (85.0)	62 (91.2)	0.22
Antivirals, hydroxychloroquine, chloroquine	1,444 (57.4)	46 (67.6)	0.11
Steroids	924 (36.8)	31 (45.6)	0.16
Clinical course			
Admission to intensive care unit	487 (20.3)	19 (31.7)	0.22
Time from onset to SARS-CoV-2 testing (days)	5 (3-8)	4 (2-10)	0.99
Time from onset to hospitalization (days)	4 (2-7)	4 (1-9)	0.60
Time from onset to death (days)	10 (7-16)	11 (7-17.5)	0.57
Time from hospitalization to death (days)	5 (3-10)	6 (3-12)	0.36

Data are expressed as mean ± standard deviation, n (%), or median (IQR).
 Missing data for the overall sample (n = 2,687): comorbidities n = 64 (2.4%); symptoms n = 92 (3.4%); treatments n = 105 (3.9%); clinical course n = 231 (8.6%).

received, admission to intensive care units, and times to clinical milestones (all p > 0.05). Almost all individuals of both groups (97.0% of natives and 96.9% of migrants) developed acute respiratory distress syndrome as life-threatening complication.

DISCUSSION

To the best of our knowledge, this study reported for the first time data on international migrants deceased during the COVID-19 pandemic in Italy. The distribution of COVID-19-related and all-cause mortality in

migrants and natives in Italy is not substantially different suggesting that the mortality advantage in migrants does not apply to COVID-19. These data provide insights to inform the current debate on Italian media and social networks regarding the concerns that migrants are spared or only marginally affected by SARS-CoV-2 infection [9].

The clinical phenotype of migrants, investigated in a limited but representative sample of individuals deceased in hospital settings, was similar to that of natives except for the younger age at death, that was somehow expected given the different shape of the age pyramids of the two populations [10]. Indeed, only 7.1% of migrants living in Italy *versus* 24.7% of natives are older than 65 years [11]. Accordingly, all-cause mortality rates over the age of 60 years are markedly lower among foreign-born individuals residing in Italy relative to natives [12]. Nevertheless, the present findings might not be representative of COVID-19-related outcomes in the overall, heterogeneous population of migrants. First, the countries of origin of the sampled migrant individuals do not perfectly match with those of the broader migrant population living in Italy, even if they mirror their main attributes (e.g., income and migratory pressure) (Table 1) [5]. Moreover, our estimates most likely apply to migrants who are well-integrated and have access to healthcare resources and services. This hypothesis seems corroborated by the similar demographic and clinical characteristics of migrants and natives deceased for COVID-19. We cannot exclude that more marginalized migrants such as refugees, asylum seekers, and undocumented migrants (who also do not have an Italian tax code) behave differently in terms of clinical phenotype and COVID-19-related outcomes. These particularly vulnerable individuals, usually underrepresented in mortality analyses [1], might have a higher risk of contracting infectious diseases, including COVID-19, and experiencing poorer outcomes due to poor living conditions, difficulties at adopting restrictive measures, scarcity of protective equipment, limited access to testing procedures and treatments [13]. In this regard, a limitation of the present study is the lack of information on diverse determinants (e.g., reason for migration, duration of the migration, acculturation, socioeconomic status, ethnicity) that have already been shown to influence health outcomes in the variegated migrant population and may also affect the course of COVID-19 [14]. Future international, prospective, adequately powered and *ad hoc* studies are needed to disentangle the role of these factors in understanding the ongoing pandemic.

In conclusion, our study confirms that, with obvious inter-individual variability, natives and migrants are all on the same boat in dealing with the pandemic and reinforces the belief that, even in this contingency, we must

pursue ideals of equity and universality in public health actions, communication, and information sharing.

Authors' contributions

Marco Canevelli designed the study, had full access to all data in the study, and takes responsibility for the integrity and accuracy of the data analysis. Luigi Palmieri was responsible for data analysis. Chiara Donfrancesco and Cinzia Lo Noce were responsible for supervision of data collection and data management.

Marco Canevelli, Luigi Palmieri, Valeria Raparelli, Nicola Vanacore, and Graziano Onder drafted the manuscript. All Authors (including all members of the Italian National Institute of Health COVID-19 Mortality Group) contributed to data collection and discussion. All Authors reviewed and approved the final version of the manuscript. The corresponding Author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

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Conflicts of interest statement

Authors have no competing interests to disclose for the present study.

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REFERENCES

1. Aldridge RW, Nellums LB, Bartlett S, et al. Global patterns of mortality in international migrants: a systematic review and meta-analysis. *Lancet*. 2018;392(10164):2553-66. doi: 10.1016/S0140-6736(18)32781-8
2. Wallace M, Khat M, Guillot M. Mortality advantage among migrants according to duration of stay in France, 2004-2014. *BMC Public Health*. 2019;19(1):327. doi: 10.1186/s12889-019-6652-1

3. Reus-Pons M, Vandenheede H, Janssen F, Kibele EUB. Differences in mortality between groups of older migrants and older non-migrants in Belgium, 2001-09. *Eur J Public Health*. 2016;26(6):992-1000. doi: 10.1093/eurpub/ckw076
4. Vanthomme K, Vandenheede H. Migrant mortality differences in the 2000s in Belgium: interaction with gender and the role of socioeconomic position. *Int J Equity Health*. 2019;18(1):96. doi: 10.1186/s12939-019-0983-5
5. United Nations, Department of Economic and Social Affairs, Population Division. *International Migration 2019: Report (ST/ESA/SER.A/438)*. UN; 2019. Available from: www.un.org/en/development/desa/population/migration/publications/migrationreport/docs/InternationalMigration2019_Report.pdf.
6. Riccardo F, Ajelli M, Andrianou X, et al. Epidemiological characteristics of COVID-19 cases in Italy and estimates of the reproductive numbers one month into the epidemic. *medRxiv*. 2020 Apr 11. doi: 10.1101/2020.04.08.20056861
7. Onder G, Rezza G, Brusaferro S. Case-fatality rate and characteristics of patients dying in relation to COVID-19 in Italy. *JAMA*. 2020;323(18):1775-6. doi: 10.1001/jama.2020.4683
8. Italia. Presidenza del Consiglio dei Ministri, Dipartimento della Protezione civile. Ordinanza 27 febbraio 2020. Ulteriori interventi urgenti di protezione civile in relazione all'emergenza relativa al rischio sanitario connesso all'insorgenza di patologie derivanti da agenti virali trasmissibili. (Ordinanza n. 640). *Gazzetta Ufficiale - Serie Generale n. 50 del 28 febbraio 2020*. Available from: www.gazzettaufficiale.it/eli/id/2020/02/28/20A01348/SG.
9. Meli E. Immigrati e vaccino anti-Tbc. Come stanno davvero le cose. *Corriere della Sera*. 2020. Available from: www.corriere.it/salute/malattie-rare/20_marzo_25/coronavirus-immigrati-vaccino-antitubercolare-come-stanno-cose-f13a84ba-6eb2-11ea-925b-a0c3c3dbe1130.shtml.
10. Migration and migrant population statistics - Statistics Explained. Available from: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Migration_and_migrant_population_statistics
11. Eurostat. Population (Demography, Migration and Projections). Available from: <https://ec.europa.eu/eurostat/web/population-demography-migration-projections/data/database>
12. Ministero dell'Interno. 1° Rapporto sugli immigrati in Italia. 2007.
13. Kluge HHP, Jakab Z, Bartovic J, D'Anna V, Severoni S. Refugee and migrant health in the COVID-19 response. *Lancet*. 2020;395(10232):1237-9. doi: 10.1016/S0140-6736(20)30791-1.
14. Pareek M, Bangash MN, Pareek N, et al. Ethnicity and COVID-19: an urgent public health research priority. *Lancet*. 2020;395(10234):1421-2. doi: 10.1016/S0140-6736(20)30922-3