Ital J Gender-Specific Med 2020; 6(3): 96-99

Gender differences in COVID-19 cases and death rates in Italy

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Summary. According to the latest information supplied by the Italian National Institute of Health (ISS) up until May 20th, there have been 227,169 cases of COVID-19 microbiologically diagnosed in Italy, of whom 54% were women. On the same date, 31,017 deaths were registered but, in this case, women accounted for only 40% of the total, a proportion that rises to 66% after age 90. Considering the total cases rates by age, levels are slightly higher for women up to 50 years of age and higher for men up to 80. Only from 90, women surpass men with much higher values. On the contrary, mortality rates are higher for men at all ages, particularly in the ages 50-69 male mortality is more than three-fold that of women. However, official COVID-19 data underestimate deaths. According to Istat&ISS estimates from 20 February to 31 March 2020, deaths due to COVID-19 infection represent only 54%. Ninety-one percent of the excess mortality registered at national level is concentrated in areas where the epidemic was widespread.

Key words. COVID-19, gender differences, deaths underestimation.

Differenze di genere nei casi di COVID-19 e nei relativi tassi di mortalità in Italia

Riassunto. Secondo le ultime informazioni rese note dall'Istituto Superiore di Sanità (ISS), fino al 20 maggio 2020 si sono contati in Italia 227.169 casi di COVID-19 diagnosticati microbiologicamente, il 54% dei quali erano donne. Alla stessa data, si erano registrati 31.017 decessi e la proporzione di donne scende al 40%, per risalire al 66% dopo i novant'anni. Considerando i tassi di incidenza del contagio per età, i livelli sono più alti per le donne fino ai 50 anni e per gli uomini nelle età successive e fino a 90 anni. Solo dopo questa età, le donne tornano a superare gli uomini con tassi nettamente più elevati. Al contrario, i tassi di mortalità sono più alti per gli uomini a tutte le età e arrivano a valori che sono più di tre volte quelli delle donne nelle età 50-69 anni. Secondo le stime effettuate dall'ISS e dall'Istat per il periodo dal 20 febbraio al 31 marzo, i decessi attribuiti alla COVID-19 risultano notevolmente sottostimati in quanto rappresentano solo il 54% dell'eccesso di mortalità registrato nello stesso periodo a livello nazionale. Il 91% di questo eccesso di mortalità è concentrato nelle regioni in cui l'epidemia si è diffusa maggiormente.

Parole chiave. COVID-19, differenze di genere, sottostima dei decessi.

Measured by survival levels, longevity in Italy is one of the highest in the world: women have a life expectancy of 85.2 years and men of 80.8 (life tables 2018). This means that, on average, women live 4.4 years more than men, a gap that is the same in the North and the South of the Country, despite a greater life expectancy for both men and women in the North (81.2 and 85.5 years, respectively) and a slight disadvantage for both genders in the South (80.2 and 84.6 years). In Lombardy – the region currently worst hit by the COVID-19 pandemic – men and women, according to the figures presently available, can count on one of the highest life expectancy in the Country, and also in Europe, with 81.3 and 85.7 years, respectively. Italy boasts one of the best universal care systems in Europe, and the regions in the North of the Country enjoy the highest survival levels, partly due to the extremely high quality of their health services. Despite this excellent system, however, Italy is among the Countries where the pandemic has produced the greatest number of deaths in the entire world, with a devastating impact in the very same regions of the rich North, where economic and healthcare conditions are the best.

Data and method

Official data on COVID-19 cases and deaths are provided by the *Istituto Superiore di Sanità* (ISS, the Italian National Institute of Health), which is responsible for the *Sistema di sorveglianza integrata* (SSI, Integrated Surveillance System). The data on excess mortality at national and regional level in the period between February 20 (the date of the first death from COVID-19 in Italy) and March 31, 2020, has been provided by Italian National Institute of Statistics (Istat, *Istituto nazionale di statistica*)[1], with reference to the deaths from all causes registered in the same period among the Italian population (the estimate concerns the mortality registered in over 6,000 municipalities, representing 89% of the population). This excess mortality can be interpreted as an estimate of the direct and indirect effect produced by COVID-19 on total mortality.

Rates are calculated with reference to the Italian population by age and gender, as estimated as of January 1, 2020.

Results and discussion

According to the latest information supplied by ISS up until May 20, in Italy there have been 227,169 cases of microbiologically diagnosed COVID-19 (nasopharyngeal tampon positive to SARS-Cov-2), of which 54% were women.[2] The median age is 62. In the two age brackets 0-9 and 60-79 the greater number of cases are among men. Over the age of 90, the absolute number of infected women is over three-fold that of men, due to the greater number of women in this age bracket and the greater level of risk.

On the same date, along with more than 227,000 cumulative positive cases of infection, 31,017 deaths were registered (which on May 24 had already gone up to 32,785), but in this case women accounted for only 40% of the total, a proportion that increases to 66% after age 90. Overall, for the two genders, the median age is 81 (85 for women and 79 for men).[2] It should be noted that 82% of the deaths have been registered in the regions of the North, and 50.4% in Lombardy alone.

If the cases of illness and the deaths classified by age and gender are related to the respective populations of men and women estimated on January 1, 2020, we obtain the total cumulative cases and death rates (both in 10,000) illustrated in Figures 1 and 2, on the left. The two indicators measure the strength of the two phenomena in the various ages of life, net of the different size of the respective populations. Figure 1 shows the characteristics of the total case rates by age, which are very different for men and women: slightly higher for women up to 50 years of age and higher for men up to 80. Only from 90 years of age do we see women surpassing men, with much higher values. In fact, the relations between male and female rates clearly show very low diffusion levels for women between 60 and 80 (see also Figure 1/right). To understand the causes of these particularly favorable levels for women in this age range, we shall need further investigations and specific studies.

If we analyze the mortality rates by age in Figure 2/left, the image clearly shows that mortality is higher for men at all ages, even after 90, just as the relation between the male and female levels illustrated in Figure 2/right indicates that between the age 50-69 male mortality is more than three-fold that of women. Even at extreme old ages, when illness is more prevalent for women, male mortality is one and a half time that in women. The gender differences in COVID-19 mortality rates in Italy thus confirm what has already emerged in China, in the city of Wuhan: an advantage for women at all ages.[3] The extensive debate on the possible mechanisms that work in favor of women can be summarized by recalling some of the explanatory theories that have been suggested by experts in various disciplines. In the medical and bio-genetic field, attention is drawn to the greater immune response of women, but – in the specific case of this infection – we need to remeber that the differences may also be hormonal and genetic.[4] In the epidemiological and healthcare field, the explanations being advanced refer in particular to gender differences

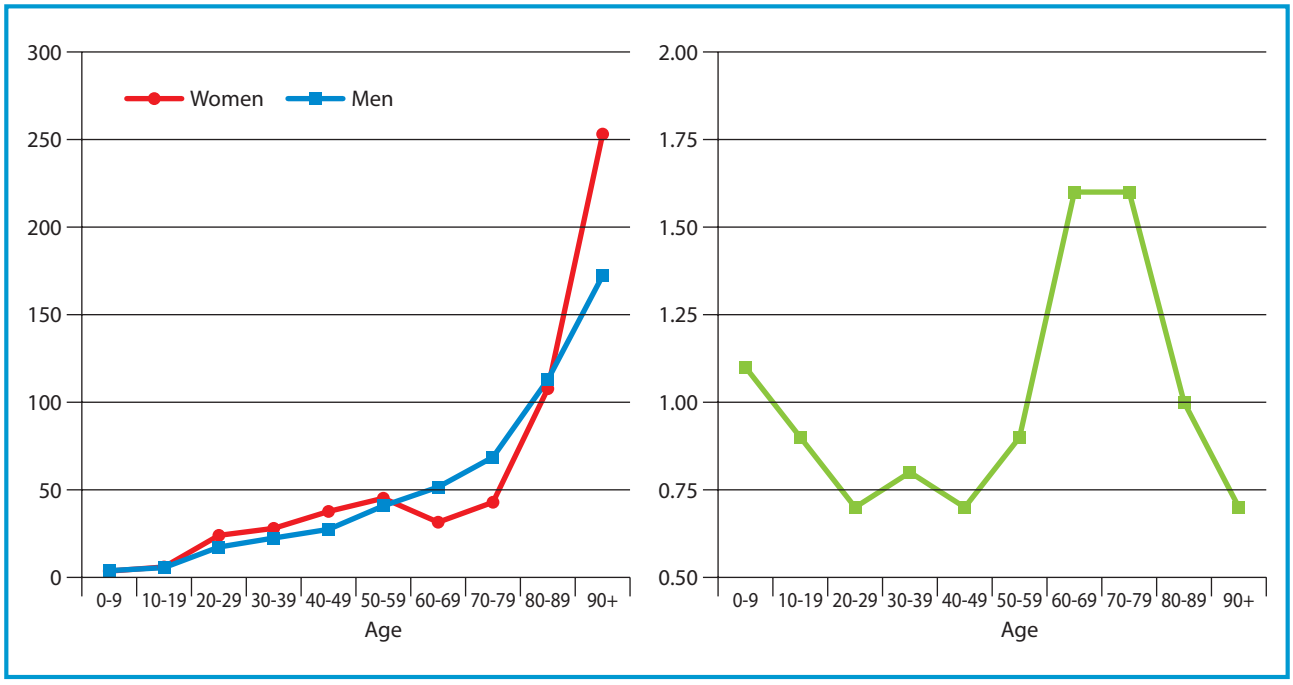

Figure 1. COVID-19 cases observed until May 20, by gender and age (rates for 10,000) (left) and gender ratio (men/women ratio) (right). Source: ISS, 2020.[2]

in life styles and exposure to environmental and workplace risks.[5]

The figures, however, underestimate the mortality rates, since these include only the COVID-19 cases that have been diagnosed microbiologically, thus excluding most of the deaths occurred at home and in care homes for the elderly, in whom diagnostic tests were administered more rarely, if at all. The deaths from COVID-19 registered by the SSI from February 20 to March 31, 2020, were 13,710, while the total deaths from all causes from the national statistics for the same period were 90,946. On the basis of the trend estimated on the deaths of the previous five years (2015-2019), the estimate for the period under consideration was expected to be equal to 65,592. The difference between the deaths observed and those expected is 25,354 units, of which the 13,710 due to a diagnosed COVID-19 infection represent only 54%. For the remaining 46% – unless there were significant changes in the recent mortality trend, which at present do not seem to have occurred – we can assume it is an estimate of the quota of deaths directly or indirectly caused by COVID-19. We should consider that, in additions to the deaths directly caused by the virus that remained undetected – and thus unregistered – by the SSI, the dramatic impact of the epidemic caused an overcrowding of the hospital facilities that, in the areas most seriously hit, prevented the effective treatment of other conditions.

Ninety-one percent of the excess mortality registered on average at national level in the period considered is concentrated in the areas where the epidemic is widespread (3,271 municipalities, 37 provinces of the North, as well as Pesaro and Urbino). In these areas, the observed number of deaths from all causes has been 49,351, against the expected 26,218. The difference is an excess of 23,133 deaths (25,354 nationally), almost twice the 12,156 COVID-19 deaths registered by the SSI. If we consider only the deaths after age 50, these explain about 62% and 42% of the differences between the deaths observed and expected for men and women, respectively.[1]

It is also certain that, in 2020, the advantage in survival that the regions of the North have so far enjoyed over the less economically developed areas of the South will inevitably be reduced, or even become a disadvantage, in some of the provinces most hit by the infection. Their healthcare systems – which are considered excellent, but often too hospital-centered – proved to be inadequate for the great task that awaited them, which was that of preventing the death of the weakest, namely those who, due to their old age, most frequently suffered from conditions pre-dating the pandemic.[6] Figure 3 shows the most frequent comorbidities affecting SARS-CoV-2-positive people who then died, as well as the crucial role played by hypertension and other circulatory system conditions. Moreover, 61% of the women (59% of the men) who died had three or more comorbidities, while only 2.7% of them (4.8% in the case of men) did not suffer from any other disease. It should be emphasized, however, that, after age 65 the proportion of people with two or more chronic diseases is around 60%.

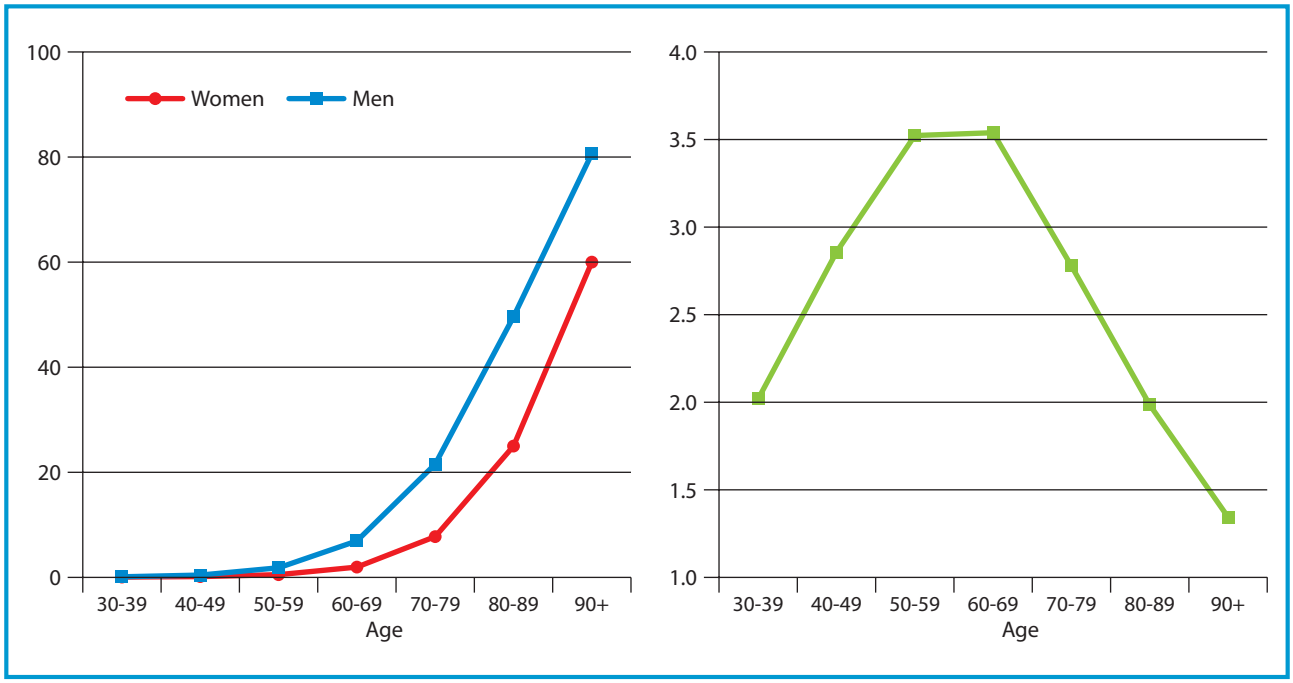

Figure 2. COVID-19 deaths observed until May 20, by gender and age (rates for 10,000) (left) and gender ratio (men/women ratio) (right). Source: ISS, 2020.[2]

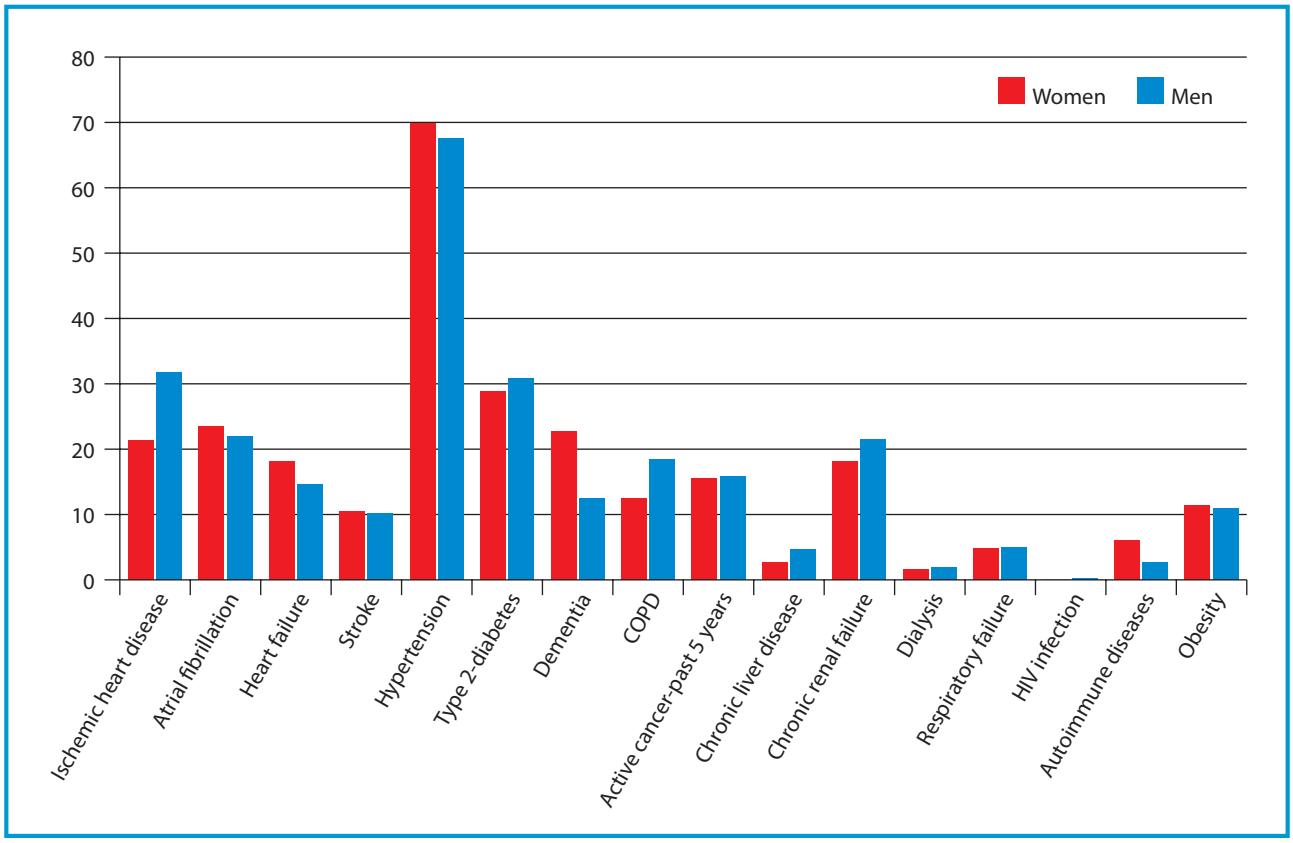

Figure 3. The most common comorbidities observed in SARS-CoV-2-positive people then deceased, by gender (percent values), based on the data available on May 21. Source: ISS, 2020.[6]

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Authors' contribution statement: both Authors equally contributed to data collection and analysis. Both participated in conceiving the content and equally contributed to writing the manuscript. Both have reviewed, read and approved the final version of the manuscript.

Conflict of interest statement: the Authors declare no conflicts of interest.

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