



# COVID-19 Infection and Mortality Rates within Medical Specialists and General Practitioners and Its Comparison with the General Population: A Longitudinal Nationwide Study

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## Abstract

**Background:** We aimed to provide data regarding COVID-19 infection and mortality rates within different specialties of physicians and general medical practitioners in a longitudinal nationwide study and to compare the results with general population.

**Methods:** Data on COVID-19 infection and mortality of medical physicians in Iran was actively gathered through the Iranian Medical Council (IRIMC). Population COVID-19 cumulative incidence and mortality data were extracted from WHO situation analysis reports and data on Iranian population were obtained from the Statistical Center of Iran.

**Results:** As of Jul 27<sup>th</sup> 2020, COVID-19 infection and mortality rates were 0.680% and 0.0396% among 131223 physicians. The highest cumulative infection rates as of 27<sup>th</sup> July 2020, were observed in specialists of infectious diseases (3.14%) followed by neurology (2.18%), and internal medicine (2.13%). The highest cumulative mortality rates as of Nov 3<sup>rd</sup> 2020 were observed in specialties of forensic medicine (0.314%), anesthesiology (0.277%), urology (0.237%), and infectious diseases (0.20%). Male physicians comprised 95% of cumulative mortality as of Nov 3<sup>rd</sup>. The physicians' COVID-19 mortality in July and November were 49% and 23% higher than the general population respectively.

**Conclusion:** Infection and mortality rates in Iranian physicians were higher than the general population, however the magnitude of difference was narrowing in longitudinal investigation. Provision of personnel protective equipment should be prioritized to specialists of infectious diseases, forensic medicine, anesthesiology, internal and emergency medicine, and urology.

**Keywords:** COVID-19; Specialty; Medical personnel; Mortality; Incidence

## Introduction

As of Sep 4<sup>th</sup>, 2020, there have been a total confirmed COVID-19 cases of more than 26 million with more than 865000 lives lost including more

than 7000 medical personnel which constitutes 0.8% of total mortality.

Few reports have been published on the analysis of health care workers who have been infected



with COVID-19 or died from it (1-4). No report has evaluated the distribution of medical specialties infected with COVID-19 with respect to their specialty or explored the risk of infection within each medical specialty. This would be of utmost importance in the provision of personal protective equipment (PPE) and protective facilities for medical personnel and medical wards as frontline personnel are not necessarily at a higher risk of infection (5).

In this report, we aimed to explore the infection and mortality rates of physicians in a longitudinal nationwide database of medical staff COVID-19 status gathered by the Iranian Medical Council (IRIMC) and to compare the above statistics with national incidence and mortality figures of COVID-19.

## Methods

The IRIMC is a non-governmental, professional organization and every Iranian physician is required to be registered with IRIMC to be eligible for medical practice. This organization has branches in every province and major cities.

The information on COVID-19 infection and mortality of Iranian physicians was actively collected by the central and provincial branches of IRIMC. COVID-19 infection was confirmed by positive nasopharyngeal PCR result. Data was gathered on infection and mortality of medical staff until 27<sup>th</sup> Jul 2020. Afterwards, data was gathered only on mortality. The updated data of 27 Jul 2020 was used calculation of COVID-19 cumulative infection. Mortality data of 27<sup>th</sup> Jul and Nov 3<sup>rd</sup> were used for mortality calculations and investigation of trend in mortality within different specialties. Age and gender data on deceased physicians was available on the cumulative mortality data of November 3<sup>rd</sup>.

Statistical analysis was performed on infection and mortality of physicians across different specialties/subspecialties. Chi square test was used to compare the number of infected, deceased physicians across specialties and also to compare the gender distribution of deceased physicians

across different specialties/subspecialties. One-way analysis of variance was used to compare the age distribution of deceased physicians across different specialties/subspecialties. Categories with only one deceased physician were excluded to perform post Hoc tests in one-way analysis of variance.

The national number of patients infected with COVID-19 as of 27<sup>th</sup> Jul 2020, and 3<sup>rd</sup> Nov 2020 were extracted from WHO situation analysis report numbers 189 (6) and weekly epidemiological update of Nov 3<sup>rd</sup> 2020. National population data and its age distribution were extracted from the information webpage of the Statistical Center of Iran. SPSS ver. 22 (Chicago, IL, USA) was used for statistical analysis.

## Results

The total number of specialty domains for which COVID-19 status was available was 43303. Limited specialties like pathology for which COVID-19 status was mixed with laboratory personnel were excluded from analysis. The number of registered general practitioners was 87920 summing into a total number of 131223 registered physicians which encompasses 95% of registered physicians with the IRIMC. In Iran, the first COVID-19 case was reported in a patient on 19<sup>th</sup> Feb 2020. The total number of registered physicians infected with COVID-19 as of 27<sup>th</sup> Jul 2020 was 893 (0.6% of total registered physicians) and 52 physicians have died from COVID-19 during the mentioned period (0.039% mortality within registered physicians). The case mortality rate was 5.8% for Iranian physicians during Feb-Jul 2020. Graph of infection rate within different medical specialties, subspecialties, and general practitioners as of 27<sup>th</sup> July 2020 has been presented in Fig. 1. The highest infection rate has been observed in specialties of infectious diseases (3.14%), followed by neurology (2.18%), and internal & emergency medicine (2.13). The lowest infection rate has been observed in general practitioners, radiologists, and dermatologists.

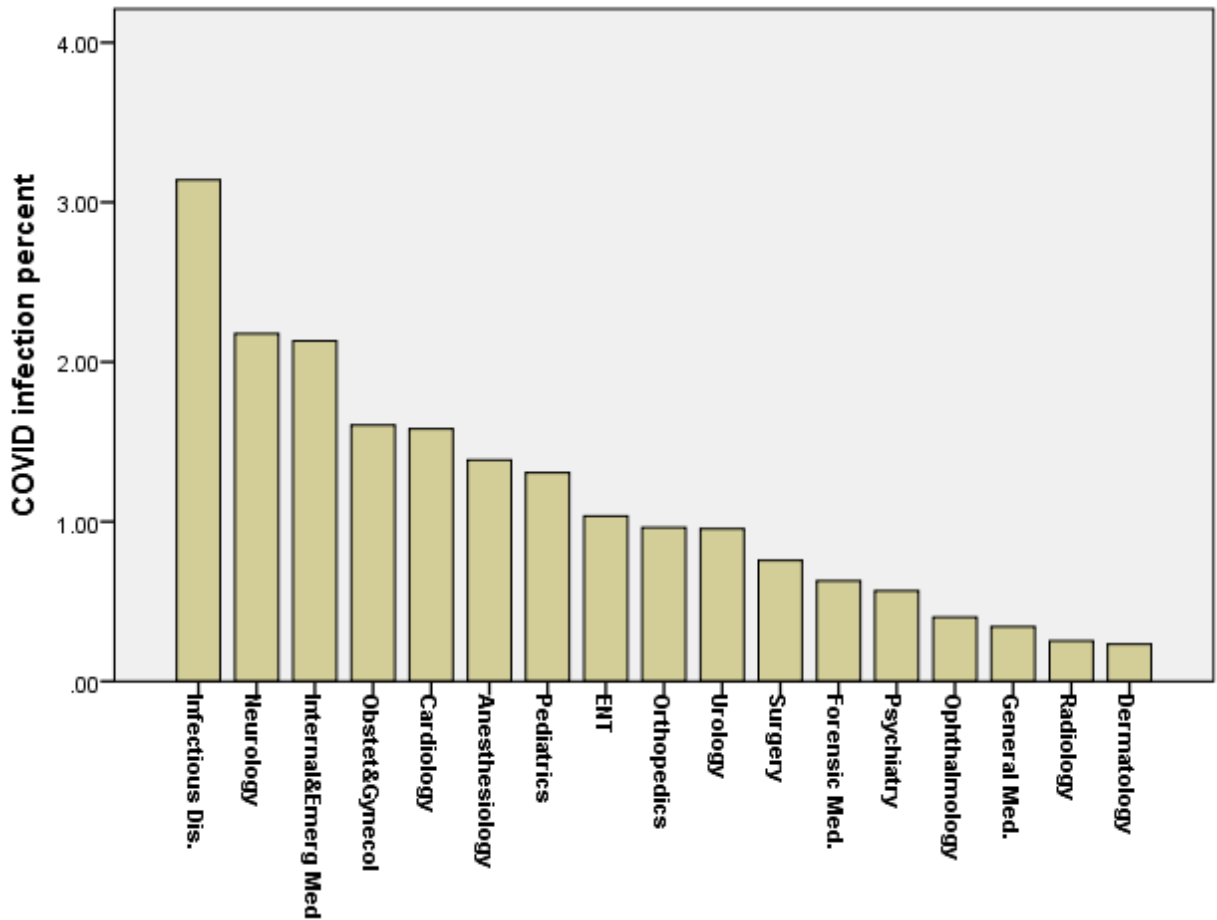


Fig. 1: COVID-19 infection rate within physicians with respect to their specialty or practice field as of 27<sup>th</sup> July 2020

The cumulative mortality data of 27<sup>th</sup> Jul and Nov 3<sup>rd</sup> show slight differences in the dominant specialties which show a higher percentage of mortality (Table 1 and Fig. 2). As the total number of expired physicians in each specialty is not high enough, addition of a limited number would lead to changes in the percentages of mortality as observed in Table 1. According to the data of 27<sup>th</sup> July 2020, the highest mortality figures were observed in specialties infectious diseases, ENT, urology and anesthesiology while the lowest mortalities were observed within specialties of forensic medicine, radiology, obstetrics, and cardiology (Table 1). The Nov 3<sup>rd</sup> data reveals highest mortality figures within specialties of forensic medicine, anesthesiology, urology,

and infectious diseases while revealing lowest mortality for specialists of obstetrics and neurology (Fig. 2). There were five (5.3%) female deceased physicians in the cumulative mortality data of Nov 3<sup>rd</sup>. These five female deceased physicians included two pediatric specialists, two general practitioners, and one internal medicine/A&E specialist. The distribution of age of deceased physicians was different between pediatric deceased physicians with deceased general practitioners (post Hoc Tukey  $P=0.037$ , Fig. 3).

The total number of COVID-19 mortality for 27<sup>th</sup> July 2020 for Iranian physicians was 52 and this figure rose to 95 on Nov 3<sup>rd</sup> 2020 indicating 83% increase within almost 2 months.

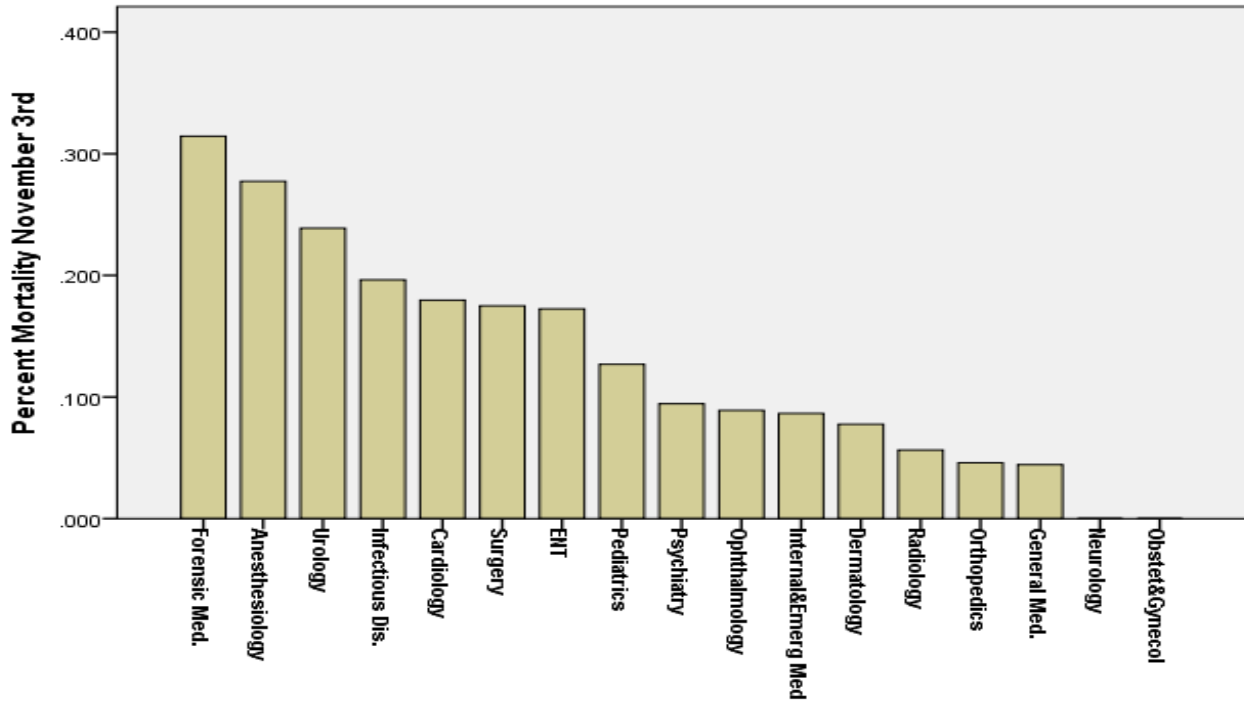


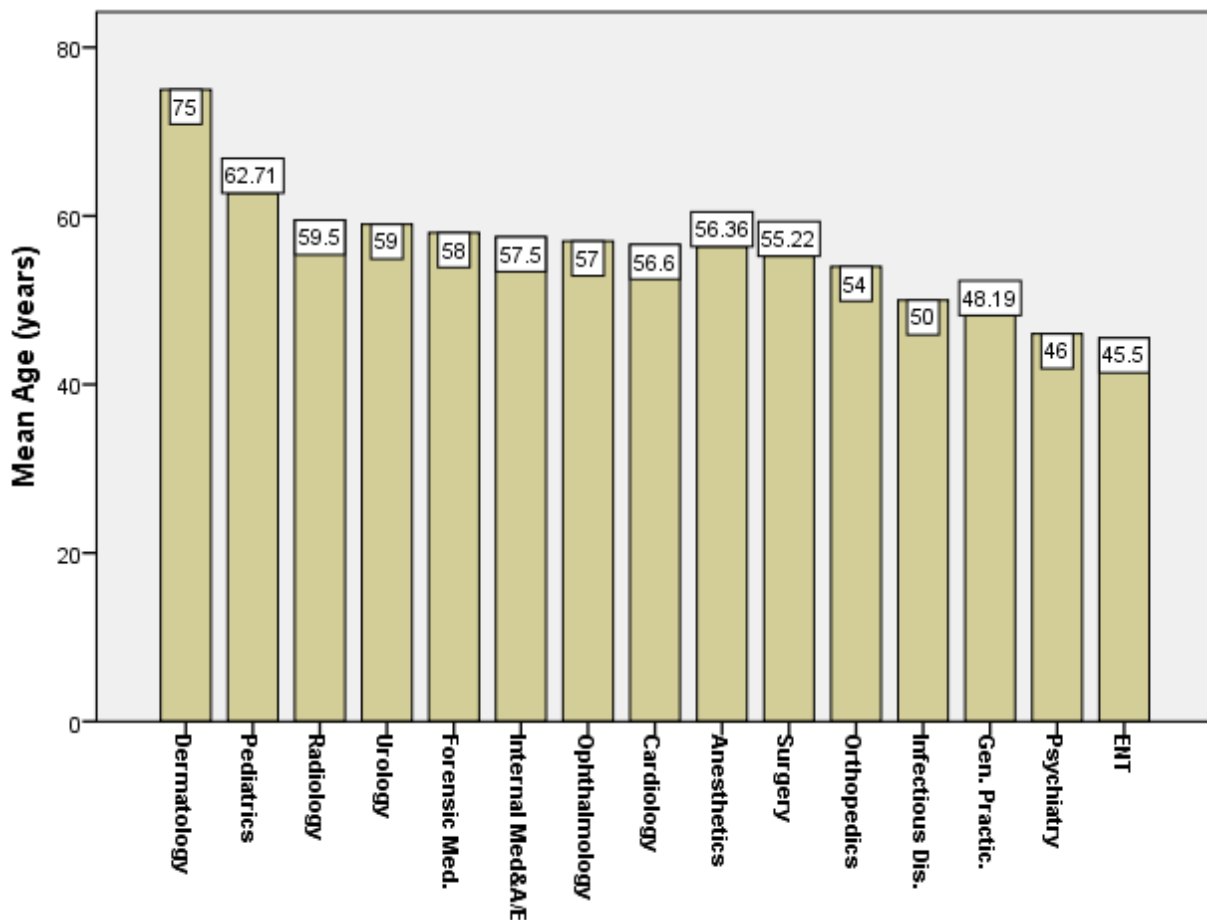
Fig. 2: Cumulative mortality rates of COVID-19 within Iranian physicians with respect to their specialty or practice field as of 3<sup>rd</sup> Nov 2020

Table 1: Cumulative number of infected and deceased physicians as of July 27<sup>th</sup> and November 3<sup>rd</sup> 2020 in each specialty/subspecialty within Iranian physicians

Specialty / sub-specialty	Total number	July 27 <sup>th</sup> COVID-19 data		November 3 <sup>rd</sup> COVID-19 data
		Infection (N/%)	Mortality (N/%)	Mortality (N/%)
Dermatology	1290	3 (0.23)	1 (0.078)	1 (0.078)
Ophthalmology	2246	9 (0.40)	1 (0.045)	2 (0.089)
Psychiatry	2117	12 (0.57)	2 (0.094)	2 (0.094)
General practitioners	87920	301 (0.34)	24 (0.027)	39 (0.044)
Surgery	5146	39 (0.76)	3 (0.058)	9 (0.175)
Internal & emergency Medicine	6942	148 (2.13)	5 (0.072)	6 (0.086)
ENT	1739	18 (1.04)	3 (0.173)	3 (0.173)
Orthopedics	2180	21 (0.96)	1 (0.046)	1 (0.046)
Urology	1256	12 (0.96)	2 (0.159)	3 (0.239)
Pediatrics	5513	72 (1.31)	3 (0.054)	7 (0.127)
Anesthetics	3966	55 (1.39)	5 (0.126)	11 (0.277)
Infectious Dis.	1019	32 (3.14)	2 (0.196)	2 (0.196)
Forensic Med.	318	2 (0.63)	0 (0)	1 (0.314)
Radiology	3551	9 (0.25)	0 (0)	2 (0.056)
Obstetrics & Gynecology	5548	89 (1.60)	0 (0)	0 (0)
Cardiology	2783	44 (1.58)	0 (0)	5 (0.180)
Neurology	1240	27 (2.18)	0 (0)	0 (0)

The cumulative number of Iranian COVID-19 cases as of 27<sup>th</sup> Jul 2020 was 291172 with a total death of 15700 according to the WHO situation analysis report number 189. The case mortality rate for the general population is 5.4% during Feb-Jul 2020. The population of Iran has been reported as 83870819 and 84017987 for late Jul and early Nov according to the data of the Statistical Center of Iran. According to the latest census, 30.8% of population are age 19 or less. We excluded this population to have an age matched comparison of COVID-19 infection and mortality within physicians who are all older than 20

years with the corresponding age matched figures for infection and mortality of COVID-19 in general population. Considering that 98% of COVID-19 infection has occurred in ages of  $\geq 20$  yr in Iran, according to a report of a working group of the Ministry of Health and Medical Education, the national infection and mortality of Iran for age groups  $\geq 20$  yr would be 0.492% and 0.0265% respectively. Cumulative general population mortality had increased to 34864 as of Nov 3<sup>rd</sup> 2020 indicating 122% increase in mortality figures and producing a general population mortality rate of 0.0588% for this date.



**Fig. 3:** Comparison of age of deceased physicians across different specialties/subspecialties (only the difference of age between pediatric specialists and general practitioners was statistically significant in post Hoc Tukey)

The infection and mortality of Iranian physicians as of 27<sup>th</sup> Jul 2020 would be calculated to be 0.680%, and 0.0396% respectively. The mortality rate of Nov 3<sup>rd</sup> 2020 would be calculated to be

0.0724%. These three figures (infection and mortality of 27<sup>th</sup> Jul and mortality of Nov 3<sup>rd</sup>) are 38%, 49%, and 23% higher than the calculated corresponding figures for the general population.

Apparently, the difference in mortality of Iranian physicians with the general population is decreasing as time passes by.

## Discussion

One of the priorities of health policymakers is to ensure safety of medical staff during the COVID-19 pandemic (5). Provision of a safe environment for medical practice is not only an ethical responsibility of health sector authorities but also ensures satisfactory service provision by healthy personnel. We are aware of ward closures in some hospitals due to COVID-19 infection (7) of several personnel in a ward and lack or reserve personnel, or visit of COVID-19 patients by non-infectious disease non-internal medicine specialists due to shortage of specialty physicians as a result of their infection with COVID-19 all leading to lower quality of service provision to patients.

Therefore, evaluating the infection risk of physicians for COVID-19 regarding their specialty and practice field would help in proper prioritizing of PPE equipment for physicians at a higher risk. This investigation is of great importance as it has been previously demonstrated that front line personnel are not necessarily at a higher risk of infection. A higher risk of COVID-19 infection was reported in non-first line nurses as less PPE was provided for these personnel (5). The balanced of crude infection risk with the level of PPE provision will determine the actual infection risk of different medical personnel.

Up to our best knowledge, this study is the first to evaluate the risk of COVID-19 infection and mortality with respect to the domain specialty of each physician in a nationwide investigation. The results revealed a highest risk of infection and/or mortality for specialists of infectious diseases, internal and emergency medicine, ENT, urology, and anesthesiology. These specialties should be offered a higher priority in provision of PPE and additional safety measures against COVID-19. Interestingly the majority of mortality happened in male physicians as almost 95% of cumulative

mortality as of Nov 3<sup>rd</sup> were observed in male physician. In comparison statistics from government authorities report that 49% of Iranian physicians are female physicians which comprised only 5.3% of cumulative mortality as of Nov 3<sup>rd</sup>.

In published literature, we could not find national reports on the COVID-19 infection rate of physicians. Local reports from hospitals in China and Taiwan have disclosed infection rates of 2.09%, 2.5%, and 2.9% in physicians of one or several hospitals (1-5, 8, 9) which are much greater than the figures of this report. However, as hospital based physicians especially in referral hospitals for COVID-19 are at a higher risk of COVID-19, the inclusion of hospital-based physicians in a referral hospital, can result in a greatly higher estimate of medical staff COVID-19 infection and mortality figures compared with national figures.

The results of this study revealed that physicians are at a really higher risk of COVID-19 infection and death compared with age matched general population. Moreover, the case mortality rate of physicians was 46% higher than the general population. This observation of higher case mortality in physicians needs external verification in other countries and would be a potential source of interest to investigate the causes.

The limitations of the current study are that COVID-19 infection status was gathered by the active collaboration of IRIMC provincial offices so that the possibility of missing some infections persist and the actual numbers can be higher but this limitation can be also expressed for the general population as well. Second, we did not have access to detailed information on the infected physicians including detailed demographic information or detailed information on their disease course. Third, the number of deceased physicians is low in some specialties/subspecialties making the confidence interval of the estimations wide. Nevertheless, this is the first report to shed light on the specialty distribution of physicians who have been infected with COVID-19 or have died from it.

## Conclusion

The results of this study reveal a highest risk of infection and/or mortality for specialists of infectious diseases, internal and emergency medicine, ENT, urology, and anesthesiology. Infection and mortality rates of Iranian physicians were 38% and 23% higher than age matched general population.

## Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

## Declarations of interest

None.

## Source of funding

None.

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