

To Study Demographics as Risk Factor for Mortality Associated with COVID-19 : A Retrospective Cohort Study

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Novel coronavirus disease COVID-19 has emerged as a pandemic, claiming over 1,431,513 lives (till Nov. 27,2020) worldwide involving 191 countries . The objective of the study is to evaluate age and gender as a risk factor for COVID -19 related mortality . It is a retrospective cohort study , where the database of indoor COVID-19 positive patients was assessed for the study. Evaluation of the role of age and gender in mortality of COVID infection by comparing dataset of 2,142 indoor COVID positive patients with two outcome groups namely, death and discharged groups was done. The age comparison between two groups namely, death and discharged groups showed a median age of 60 years (IQR 50-70) for patients who died and 52 years (IQR 36-62) for the patients who recovered from COVID (p value-<0.001). There were 9 (0.65%) pediatric patients (<12 yrs) in the group of patients who recovered .For gender analysis (n=2129), COVID patients who died were 32.5%(n=692) ,out of which 63.6%(n=440) were males and 36.4%(n=252) were females. COVID positive patients in discharged group were 67.5%(n=1437),out of which 61.2%(n=880) were males and 38.8%(n=557) were females. There was no statistical difference between the two groups for mortality risk based on gender for COVID -19 infection (chi square value of 1.09, p value=.296) and the relative risk of death in males and females who died of COVID was 1.052 (95% CI=0.92-1.204). COVID-19 infection is showing predilection for male gender in both death and discharged group but the males and females are equally susceptible to the risk of death .

Keywords: COVID-19; Demographics; Mortality risk; risk factors.

Novel coronavirus disease COVID-19 has emerged as a pandemic, claiming over 1,431,513 lives (till Nov. 27,2020) worldwide involving 191 countries.¹ More than 1,35,715 deaths(till Nov. 27,2020) have been reported from India . Out of these 4,710 deaths (till Nov. 27,2020) have been reported from Punjab.²

Coronaviruses are a family of enveloped, single stranded, zoonotic RNA viruses which can

rapidly mutate and recombine, leading to novel viruses that can spread from animals to humans³ These RNA viruses have glycoprotein spikes that give them a crown like appearance.⁴

The mode of disease spread is by droplets generated by infected people during sneezing and coughing.^{5,6} Incubation period varies from 2-14 days with a median of 5 days. The severity and fatality are higher in the elderly, especially above

the age of 60 and those with comorbidities like heart disease, hypertension, diabetes etc.⁷

In this study, we will investigate the associations between various factors like age and gender as risk factors for COVID-19-related mortality in patients admitted to the hospital. However, little data on the prognostic factors of COVID-19 have been reported. This is the first regional study evaluating the role of age and gender in mortality of COVID infection by comparing huge dataset of thousands of people with two outcome groups namely, death and discharged groups.

MATERIAL AND METHODS

Study design

It is a record based retrospective cohort study. For the COVID-19 cohort in this study, database of Covid hospital, Rajindra hospital Patiala for COVID-19, from July 1 to November 30, 2020, was assessed. The information used in this study is anonymous and covers only age and gender data. In the first group named Death group data of COVID positive patients who died was analysed and in the second group named Discharged group, the data of COVID positive patients who recovered and were discharged from the hospital was included. The study protocol was approved by the Institutional Ethics Committee.

Sample size

Database of COVID-19 positive patients hospitalized between the months of July 2020 and November 2020 was included for analysis in this study. Sample size for age analysis was data of 2,142 indoor covid positive patients out of which 705 died and 1437 recovered and discharged from the hospital. Sample size for various variables analysis differed by ± 25 because of some missing values in the database.

Statistical analysis

Continuous variables were described using mean \pm standard deviation and categorical variables were presented as frequency rates and percentages. We used independent group *t* tests to compare means for continuous variables when the data were normally distributed. In the case of age group analysis Levene's test was significant ($p < .05$), suggesting a violation of the equal variance assumption, but seeing the sample size

of thousands instead of using another option of Mann Whitney U test the results of students *t* test with highly significant difference were found permissible in this case. For categorical variables, we used the Chi square test, to compare differences between the dead and discharged patients groups where appropriate. The two sided *p* value of <0.05 was considered statistically significant and *p* value of <0.01 was considered as statistically highly significant. The data was subjected to statistical analysis using JASP software 0.14 version of the license.

RESULTS

A database of 2308 COVID-19 positive patients who were hospitalised between July 1 and Nov 30, 2020, was screened for inclusion in this retrospective cohort study. Out of this, data of 161 (6.98%) indoor COVID-19 positive patients was excluded due to various reasons of, referral to other hospital ($n=129$), brought dead ($n=1$) and missing values of the variables ($n=36$). Data of total of 2142 patients hospitalized for COVID-19 was included in the analysis in this study. [Table 1]

The data analysis of patients hospitalised for COVID-19 for the age comparison between two groups based on the outcome showed a median age of 60 years (IQR 50-70) for patients who died because of COVID-19 and 52 years (IQR 36-62) for the patients who recovered from COVID and were discharged from the hospital (p value- <0.001). [Table 2] There were 9 (0.65%) pediatric patients (<12 yrs) in the group of patients who recovered and were discharged from hospital.

For gender analysis ($n=2129$), COVID patients who died were 32.5% ($n=692$), out of which 63.6% ($n=440$) were males and 36.4% ($n=252$) were females. COVID positive patients who recovered and were discharged from the hospital were 67.5% ($n=1437$), out of which 61.2% ($n=880$) were males and 38.8% ($n=557$) were females. On comparing the two outcome groups for gender males were more affected with COVID in death and discharged both groups. Mean age of males and females in the death group was 57.9 ± 14.7 and 59.5 ± 13.7 respectively. Mean age of males and females in the discharged group was 50.4 ± 15.6 and 49.0 ± 18.1 respectively. Ages were comparable

between men and women in both patients who deceased and survived.[Table 3] Of the 692 patients in the death group,63.6% were men and 36.4 % were women. The number of men was 1.74 times that of women in the death group. It was evident from the results where male gender is

showing clear cut predilection for COVID infection compared to females in both death and discharged group. There was no statistical difference between the two groups for mortality risk based on gender for COVID -19 infection (chi square value of 1.09, p value=.296).[Table 4] The relative risk of death

Table 1. Flow chart of data disposition in the study

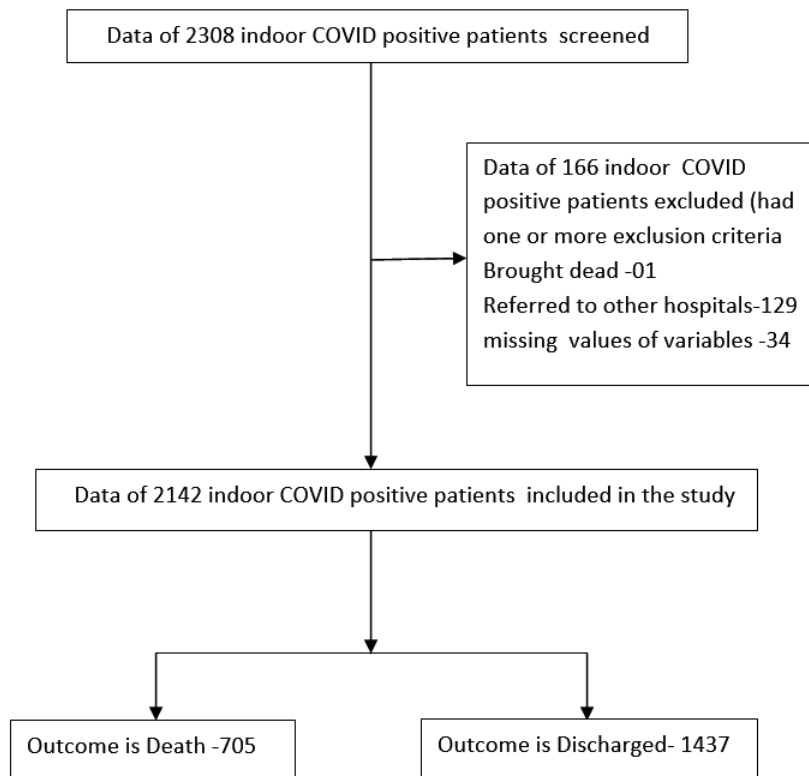


Table 2. Analysis of data for age as risk factor for COVID -19 related mortality

	Comparison of age in death and discharged group	
	Death	Discharged
Valid	705	1437
Missing	0	0
Mean	58.511	49.848
Std. Deviation	14.348	16.615
Median	60.000	52.000
25th percentile	50.000	36.000
50th percentile	60.000	52.000
75th percentile	70.000	62.000

in males and females in death group was 1.052 (95% CI=0.92-1.204). as this confidence interval includes value of 1, so the risk ratio shows that incidence of risk of death in death group amongst males and females is same.

Table 3. Independent Samples T-Test

	t	df	p-value
Age	11.845	2140	<0.001

Note: Student's t-test. Levene's test is significant (p < .05), suggesting a violation of the equal variance assumption

Table 4. Analysis of data for Gender as risk factor for COVID -19 related mortality

	Death	Discharged	Row Total	Chi square (χ^2)	p-value
Male	440	880	1320	1.0903	0.296404
Female	252	557	809		
Total	692	1437	2129		

DISCUSSION

As the novel coronavirus continues to evolve, there are still many lacunae to our knowledge regarding the risk factors affecting the mortality caused by this deadly virus. Older age adults are more affected by this disease. However, little data on the prognostic factors of COVID-19 have been reported. This is the first regional study evaluating the role of age and gender in mortality of COVID infection by comparing huge dataset of thousands of people with two outcome groups namely ,death and discharged groups. In the first group named Death group data of COVID positive patients who died was analysed and in the second group named Discharged group , the data of COVID positive patients who recovered and were discharged from the hospital was included.

In this study of COVID-19, consistent with previous studies older age patients of median age 60 years (IQR 50-70) were died compared to median age 52 years (IQR 36–62) in the patients who recovered from COVID. According to the CDC, 8 out of 10 deaths reported in the USA occurred in adults 65 years old and above.⁸ The age-dependent defects in T-cell and B-cell function, and the excess production of type 2 cytokines could lead to a viral replication control deficiency and more prolonged pro-inflammatory responses, potentially causing poor outcomes.⁹

On comparing the two outcome groups (Death vs Discharged) for gender, males were more affected than females with COVID in death and discharged both groups(63.6% vs 36.4% ;61.2% vs 38.8%) . Mean age of males and females in the death group was 57.9±14.7 and 59.5±13.7 respectively .Mean age of males and females in the discharged group was 50.4±15.6 and 49.0±18.1 respectively.

Ages were comparable between men and women within the group in both patients who deceased and survived while higher age people were

more prone to succumb to death by COVID-19 infection showing that age is an independent risk factor for mortality leaving aside the gender. That means both males and females of higher age are at the risk of increased mortality independent of their gender(chi square ,p value=0.296). Both males and females are equally susceptible to the risk of death in death group (RR=1.053; 95%CI=0.92-1.204). The risk ratio shows that incidence of risk of death in death group amongst males and females is same enclosing value of 1 .

In a study done by Jian-Min Jin et al in china Gender Differences in Patients With COVID-19 with the Focus on Severity and Mortality they concluded that Age was comparable between men and women in all data sets . In the case series, however, men's cases tended to be more serious than women's ($P = 0.035$) while in the public data set, the number of men who died from COVID-19 was 2.4 times that of women (70.3 vs. 29.7%, $P = 0.016$).¹⁰ Thereby showing that the gender role in mortality was also observed. The percentage of males were higher in the deceased group than in the survived group ($P = 0.015$). Nevertheless, in our study based on Indian patients although COVID-19 infection is showing predilection for male gender in both death and discharged group (63.6% vs 36.4% ;61.2% vs 38.8%) but the males and females are equally susceptible to the risk of death in death group (RR=1.053; 95%CI=0.92-1.204).

CONCLUSION

The patients with COVID-19 infection requiring hospitalization are showing predilection for male gender in both death and discharged group . Ages were comparable between men and women within the group in both patients who deceased and survived while higher age people were more prone to succumb to death by COVID-19 infection showing that age is an independent risk factor for

mortality leaving aside the gender. That means both males and females of higher age are at the risk of increased mortality independent of their gender .

Labour force surveys conducted by National Sample Survey Office (NSSO), Ministry of Statistics and Programme Implementation ,Government of India the estimated female Worker Population Ratio (%) on usual status basis in the country during 2009-10 and 2011-12 are 26.6% and 23.7% respectively.¹¹ The male predilection of COVID-19 infection could be due to more outdoor exposure compared to females.

Conflict of interest

Nil

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