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MORTALITY RATE AND ITS PREDICTORS AMONG HOSPITALIZED COVID-19 PATIENTS

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ABSTRACT

To determine the in-hospital mortality rate and its predictors among covid-19 patients at a tertiary care hospital, Gujranwala, Pakistan. This was a descriptive cross-sectional study carried out in the department of medicine and allied, tertiary care hospital, Gujranwala from April 2020 to August 2020. All hospitalized covid-19 patients with positive pcr testing were included in this study. The purposive sampling technique was used. The outcome of hospitalization was categorized into two groups; one who died during hospitalization and second who survived. Spss-25 was used for statistical analysis. Chi-square test was used for qualitative, while independent sample t-test for quantitative variables to determine the significant factors associated with in-hospital mortality among covid-19 patients. Then, binary logistic regression analysiswas also performed on the significant factors associated with in-hospital mortality rate. The p values were taken statistically significant if < 0.05. In-hospital mortality rate among 937 covid-19 patients was 9%. The mean age of death group of patients was significantly higher than group of patients who survived (p<0.01). The in-hospital mortality was significantly higher among male gender (p=0.043), hypertensive patients (p<0.01), diabetic patients (p<0.01), group of patients with personal history of coronary artery disease (p<0.01), patients suffering chronic lung disease (p<0.01), and history of renal dysfunction (p<0.001). The logistic regression model explained 49.1% (nagelkerke r^2) of the variance in

the mortality group of patients and correctly classified 94.8% of cases. Increasing age was linked with an increased likelihood of displaying the death as the outcome of the hospitalization ($p<0.01$). Mortality risk was significantly high in male gender in comparison to female ($p=0.022$). Hypertensive patients were 46.97 times more likely to die with covid-19 than non-hypertensive patients. Similarly, diabetics were 90.98 times more likely to die with covid-19 than non-diabetics. The covid-19 patients managed at tertiary hospital gujranwala had an excellent survival rate. Increasing age, male gender, and history of comorbidities like diabetes and hypertension were the significant predictors of in-hospital mortality among covid-19 patients in regression analysis. The smart lockdown restricting elderly people and persons with comorbidities to go to public places like markets may be a better future policy to reduce the mortality among our population.

Keywords:covid-19, SARS-cov2, in-hospital mortality rate, predictors

INTRODUCTION

Coronavirus disease 2019 (COVID-19) is the leading cause of morbidity and mortality during recent epidemic throughout the world **[1]**. It is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV2) **[2,3]**, which was first recognized by Wuhan city of China in December 2019 **[4]**. In Pakistan, the first case of COVID-19 was reported on 26th Febuary 2020 **[5]**, while in our city Gujranwala on 3rd April 2020. The overalls mortality rate in Pakistan is approximately 2% **[6]**. In literature, one large study from Iran involving 2957 hospitalized COVID-19 patients revealed a mortality rate of 10.2% **[7]**. Increased age **[4, 8]** and presence of comorbidities **[9]** like diabetes, hypertension and cardiovascular disease are the known predictors for the mortality of COVID-19 patients worldwide. Some authors found significantly higher mortality in males **[10]**, while others could not establish the link of gender with mortality of COVID-19 patients **[11]**. The local studies focusing the prediction of mortality among COVID-19 patienst are scarce. Therefore, the author was keen to determine the in-hospital mortality rate and its predictors among COVID-19 patients at tertiary care hospital, Gujranwala, Pakistan. If some predictors are found in our studied population, they may help to form local policies of preventive measures for that specific subgroup of our population. Hence, in future, the mortality rate could be decreased among our people.

MATERIAL AND METHODS

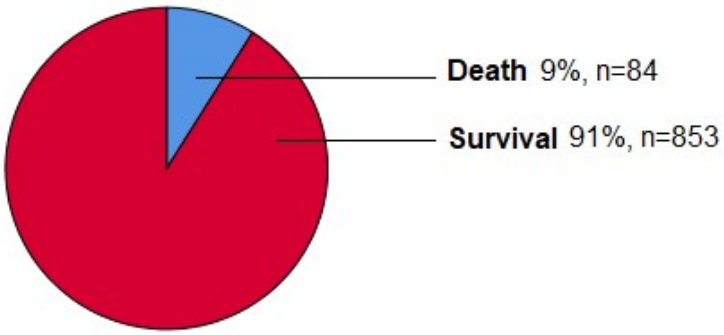
This was a descriptive cross-sectional study carried out in the Department of Medicine and allied, tertiary care hospital, Gujranwala from April 2020 to August 2020. After ethical review committee (ERC) permission, consent was obtained from the patients. The data was taken by purposive

sampling technique **[12]** using a defined performa. All the patients diagnosed with COVID-19 who were hospitalized included in this study. The diagnosis of the COVID-19 was clinical, radiological with positive PCR test. The patients with COVID-PCR negativity and with alternative diagnosis were excluded from the study. The outcome of hospitalization was categorized into two groups; one who died during hospitalization and second who survived. SSPSS version 25 was used for statistical analysis. Age was the only quantitative variable, while gender, history of hypertension, diabetes mellitus, personal history of ischemic heart disease, history of chronic lung disease, renal dysfunction and cerebrovascular accident were the qualitative variables. Chi-square test was used for qualitative, while Independent sample T-test for quantitative variables to determine the significant factors / predictors associated with in-hospital mortality among COVID-19 patients.Then, binary logistic regression analysis was also performed on the significant factors associated with in-hospital mortality rate **[13]**. The p values were taken statistically significant if < 0.05.

RESULTS

Out of the total of 937 hospitalized COVID-19 patients, 9% (n=84) died **(Picture 1)**. The mean age of the group of patients who died (58.63 $\pm$ 13.73 years) was 20.09 years higher than the group of the patients who not died (38.54 $\pm$ 17.44 years). The association was statistically valuable ($p<0.01$) **(Table 1)**. Chi-square test of independence showed that in-hospital mortality was significantly higher among male gender ($p=0.043$), hypertensive patients ($p<0.01$), diabetic patients ($p<0.01$), group of patients with personal history of coronary artery disease ($p<0.01$), patients with chronic lung diseases like COPD and asthma ($p<0.01$), and history of renal dysfunction ($p<0.001$). However, the association of in-hospital mortality with history of cerebrovascular accident was statistically insignificant ($p=0.09$). A logistic regression was done to define the effect of age, gender, hypertension, diabetes mellitus, personal history of ischemic heart disease, history of chronic lung disease, and renal dysfunction on the likelihood that participant admitted with COVID-19 would likely die. The regression model explained 49.1% (Nagelkerke R^2) of the variance in the mortality group of patients and correctly classified 94.8% of cases. Increasing age was linked with an increased likelihood of displaying the death as the outcome of the hospitalization ($p<0.01$). Mortality risk was significantly high in male gender in comparison to female ($p=0.022$). Hypertensive patients were 46.97 times more

likely to die with COVID-19 than non-hypertensive patients. Similarly, diabetics were 90.98 times more likely to die with COVID-19 than non-diabetics **(Table 3)**.



Picture 1: Mortality rate of hospitalized COVID-19 patients

Table 01: Association of Mean Age of Patients Suffering Covid-19 With Outcome of Hospitalization (Death Group/Survived Group)

Outcome of hospitalization	Mean Age (years)	Standard deviation	Mean difference	p-value	95% Confidence interval
Death	58.63	13.73	20.09	<0.01	16.24 – 23.94
No death	38.54	17.44			

*Independent sample T-test was used

Table 02: Association of Qualitative Variables of Covid Patients With Outcome of Hospitalization(Death Group/Survived Group)

Predictors / Factors	Outcome of hospitalization		Total	p-value	Odd ratio (95% Confidence interval)
	Death	No death			
Gender:					
Male	68 (81%)	597 (70%)	665 (71%)	0.043	1.82 (1.04-3.20)
Female	16 (19%)	256 (30%)	272 (29%)		
History of hypertension:					
Yes	23 (27.4%)	2 (0.2%)	25 (2.7%)	<0.01	160.43(36.96-696.42)
No	61 (72.6%)	851 (99.8%)	912 (97.3%)		
History of diabetes mellitus:					
Yes	23 (27.4%)	1 (0.1%)	24 (2.6%)	<0.01	321.25(42.66-2418.99)
No	61 (72.6%)	852 (99.9%)	913 (97.4%)		
Personal history of Ischemic heart disease:					
Yes	10 (11.9%)	0(0.0%)	10 (1.1%)	<0.01	12.53 (10.07-15.59)
No	74 (88.1%)	853 (100%)	927 (98.9%)		
History of Chronic lung disease (Asthma, COPD):					
Yes	05 (6%)	0(0.0%)	05 (0.5%)	<0.01	11.78 (9.55-14.57)
No	79 (94%)	853 (100%)	932 (99.5%)		
History of renal dysfunction:					
Yes	03 (3.6%)	0 (0.0%)	03 (0.3%)	<0.01	11.53 (9.36-14.20)
No	81 (96.4%)	853 (100%)	934 (99.7%)		
History of CVA:					
Yes	01 (1.2%)	0 (0.0%)	01 (0.1%)	0.09	11.28 (9.18-13.85)
No	83 (98.8%)	853 (100%)	936 (99.9%)		

*Chi-square test for independence was used

Table 03: Binary Logistic Regression Analysis to predict in-hospital mortality amongpatients suffering COVID-19

Risk Factors	B	S.E.	Wald-Statistic	p-value	Odds Ratio	95% C.I. for EXP(B)	
						Lower	Upper
Age (years)	-.056	.009	37.965	.000	.945	.928	.962
Sex	.973	.424	5.266	.022	2.645	1.153	6.072
Hypertension (Yes/No)	3.849	.833	21.371	.000	46.967	9.183	240.201
Diabetes mellitus (Yes/No)	4.511	1.090	17.117	.000	90.981	10.738	770.865
Ischemic heart disease (Yes/No)	21.662	9436.061	.000	.998	2557670617.145	.000	.
Chronic lung disease (Asthma, COPD) (Yes/No)	18.784	12808.983	.000	.999	143796671.079	.000	.
Renal dysfunction (Yes/No)	20.760	20224.143	.000	.999	1037318549.125	.000	.
Constant	-64.179	25731.828	.000	.998	.000		

Cox & Snell R Square = 22.3%, Nagelkerke R Square = 49.1%, B=B coefficient, SE=Standard error

DISCUSSION

Coronavirus disease 2019 (COVID-19) has emerged as a lethal disease globally **[14]**. Its presentatuion ranges from no or mild symptoms to a critical illness **[15]**. Its mean incubation period is 5.1 days **[16]**.The patients present with newly onset fever and respiratory symptoms. The definitive diagnsosis requires viroloical testing via PCR **[17]**. The management includes supportive measures where oxygen therapy has a vital role **[18]**. Now, antiviral drugs like remdesivir are also available **[19]**. Hdith Rastad *et al* **[7]** studied 2957 confirmed COVID-19 patients at Aborz, Iran. Among these hospitalized patients, 89.8% (n=2656) recovered and went back to their homes while 10.2% (n=301) died during hospitalization. In a similar study from New York, America comprising 1999 hospitalized patients, inpatient mortality rate was 14.6%. Among our 937 hospitalized COVID-19 patients, the survival rate was 91% (n=853) while death rate was 9% (n=84). In a study of 191 patients done by Fei Zhou and his colleagues **[4]**, it was concluded that increasing age was associated with the death of COVID-19 patients. Similarly, Christopher M. Petrilli *et al* **[8]** observed that old age was associated with a worse outcome hospitalization. In our study, Independent Sample T-test revealed that the mean age of patients who died of COVID-19 was significantly higher than survived group ($p<0.01$). The binary logistic regression analysis stamped the same findings. Hence, the risk of higher mortality with increasing age is similar to the rest of the world and we should be aware of special preventive measures for our elders. Rng-Hui Du *et al* **[20]** studied 179 COVID-19 Pneumonia affected patients. In regression analysis, they found that age more than 65 years ($p=0.023$) and pre-existing cerebrovascular or cardiovascular illness ($p=0.007$) are significant predictors of death among hospitalized COVID-19 patients. Weina Guo and co-parteners **[21]** concluded that diabetes

is a predictor of mortality in COVID-19 patients. In a literature review of 14 studies **[9]**, including 4659 patients concluded that existence of comorbidities like diabetes mellitus ($p < 0.01$), coronary artery disease ($p<0.01$), and hypertension ($p <0.01$) increased the risk of mortality amongst COVID-19 patients. Our findings were in concordance to international data available where in our data, 92% (23 out of 25) COVID-19 patients having hypertension as comorbidity died. 95.8% (23 out of 24) patients who were also suffering diabetes mellitus died. The COVID-19 related mortality risk was found significantly high among hypertensive patients ($p<0.01$) as well as diabetic patients ($p<0.01$) in our studied population **[22-33]**. Muhammad Javad Nisiri and his colleagues **[10]** studied COVID-19 related mortality difference in gender in a large review and concluded that females had significantly lower mortality rate as compared to males (p-value of 0.01. Odd ratio of 3.4 with 95% confidence interval of 1.2-9.1). On the other hand, in a study from Wuhan, China, no difference of COVID-19 related mortality with gender was found ($p=0.43$). However, in our study, COVID-19 related mortality rate in males was 11.39% (68 out of 665), while in females, it was just 5.88% (16 out of 272), and the difference was statistically significant both during Chi-square testing for independence ($p=0.043$) as well as during binary logistic regression analysis ($p<0.01$).

CONCLUSION

The COVID-19 patients managed at tertiary hospital Gujranwala had an excellent survival rate. Increasing age, male gender, and history of comorbidities like diabetes and hypertension were the significant predictors of in-hospital mortality among COVID-19 patients in regression analysis. The smart lockdown restricting elderly people and persons with comorbidities to go to public places like markets may be a better future policy to reduce the mortality among our population.

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CONFLICT OF INTEREST

Authors declare no conflict of interests.

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