Original Article

Predictors of Mortality of COVID-19 cases In Benazir Bhutto Hospital Rawalpindi

Sidra Tahir[1], Sadaf Zaman[2], Lubna Meraj[3], Faisal Sheraz[4], Savida Ilyas Dar[5], Nadia Shams[6]

[1] Head of Department, Emergency Department, Unit-II, Pakistan Air Force Hospital, Islamabad.
[2] Senior Registrar, Department of Medicine, Benazir Bhutto Hospital, Rawalpindi.
[3] Associate Professor, Department of Medicine, District Head Quarter (DHQ) Hospital, Rawalpindi.
[4] MD Medicine.
[5] Consultant, Department of Medicine, Polyclinic Hospital, Islamabad.
[6] Professor, Department of Medicine, Rawal Institute of Health Sciences, Islamabad.

Author`s Contribution
[1] Conception of study
[2,4,5] Experimentation/Study conduction
[1] Analysis/Interpretation/Discussion
[3,5] Manuscript Writing
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[6] Facilitation and Material analysis

Corresponding Author
Dr. Lubna Meraj
Associate Professor,
Department of Medicine,
District Head Quarter (DHQ) Hospital,
Rawalpindi
Email: lubnameraj@gmail.com

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Abstract

Introduction: There has been a global epidemic of COVID-19 caused by a novel coronavirus (SARS-2). Current research aims to study the demographic, clinical characteristics and co-morbidities in COVID-19 related deaths.
Materials and Methods: This observational (descriptive) study was conducted at BBH Rawalpindi based on data from 1st March-15th June 2020 after ethical approval. ***Inclusion criteria*** were the deceased COVID PCR positive cases (≥18 years of age) of both genders. ***Exclusion criteria*** were negative PCR, doubtful diagnosis and expiry outside the hospital setting. Data were collected from hospital records and family members. Demographic details, symptoms, duration of hospital stay, co-morbidities, type of ventilatory support were documented. Data analysed by SPSS, significant $p<0.05$.
Results: There were 54 expiries from1st March to 13th June, 42(78%) males & 12(22%) females. The mean age was 54.24±12.78 years. 76% had various comorbidities, i.e., diabetes (57%), hypertension (54%), ischemic heart disease (20%); stroke, cancer, COPD and hypothyroidism (<10% each). The most frequent cause of death was acute respiratory distress syndrome due to COVID-19. Two patients died of sepsis and multiorgan failure. 64% of patients received mechanical ventilation and 35% oxygen via non-rebreather masks. There was an average of 4 days on the invasive mechanical ventilator. 51-60 years had the longest duration of illness and hospitalization till death, while 20-30 years had the shortest. The average mortality climbed up (25% to 57%) from April to May 2020.
Conclusion: COVID-19 claims significant mortality. The risk factors for mortality being age above 50 years, male gender, co-morbidities like diabetes, hypertension, ischemic heart disease, need for mechanical ventilation upon admission and longer duration of illness. There is a need to intensify the vaccination and prevention in the community keeping in mind these high-risk groups. The high-risk cases, need to be aggressively managed to reduced mortality and improve outcomes.
Keywords: COVID-19. Co-morbidities. Mechanical Ventilation. Diabetes Mellites. Hypertension.

Introduction

Coronavirus disease 2019 (COVID-19) is caused by the SARS-Cov-2 virus, a highly infectious disease that was first reported in Wuhan city of China in December 2019.[1] Statistics show that till October 2020, approx. 36 million cases had been reported globally with >10,00,000 deaths.[2] The figures are still rising despite social distancing and preventive measures. Pakistan is facing the COVID-19 Pandemic just like the rest of the world. Since the population dynamics of Pakistan are considerably different than that of the western world, it is essential to understand the features that are unique to the Pakistani patients who have died due to the COVID-19 infection.

COVID-19 presents with a wide spectrum of symptoms, patients being asymptomatic to having life-threatening acute respiratory distress syndrome (ARDS). The COVID-19 has led to multiple causalities worldwide. It has been observed that the Intensive care unit (ICU) patients were more likely to have comorbidities, in comparison to non-ICU patients, including diabetes (35.4% vs. 20.3%) and hypertension.[3] Lack of collated health care systems like the 'National Health Services' of the United Kingdom and as in other western countries have added to the paucity of accurate clinical data available regarding the patient-specific traits & the severity of infection in the region.

A review article by Tian et al concluded that COVID-19 patients with hypertension, diabetes, ischemic heart disease, cardiometabolic disorders and end-organ damage were at high risk of mortality.[4] A Saudi study found a high prevalence of diabetes amongst admitted COVID-19 patients, also there was high mortality associated with poor diabetic control, geriatrics, lung involvement, severe deficiency of vitamin D and renal impairment.[5]

There has been limited data available addressing COVID. The short term research is available regarding the symptomatology, diagnosis, management and mortality of COVID-19. However, results from long-term studies are yet awaited. Worldwide observational studies and case series are being published to highlight the characteristics of deceased patients in China[6,7] and other countries. This study aims to highlight COVID-19 patient characteristics at a local hospital in Pakistan. The identified risk factors according to data from the current study can be implemented in the screening of COVID cases, hence identifying high-risk cases that can be investigated and managed for a better outcome in terms of mortality as well as morbidity.[8]

Materials and Methods

This observational (descriptive) study was conducted at Benazir Bhutto Hospital Rawalpindi i.e. one of the busiest Public sector hospitals. The research proposal was approved by the Benazir Bhutto Hospital's Institutional ethical committee. The duration of data collection was from 1st of March to 15th June 2020. Consent was obtained from the blood relations of the deceased.

Inclusion criteria: The deceased COVID PCR positive cases were included by consecutive sampling. Adult cases $\geq$ 18 years of age of both genders were included.

Exclusion criteria: The cases with negative PCR or doubtful diagnosis weren't included. Also, the cases whose families didn't give consent were excluded. Cases the expired after being shifted out or discharged from the hospital were also excluded. The data was collected from hospital records and also from an interview with a family member. Demographic details, age, gender, duration and types of symptoms were inquired. The duration of the hospital stay was documented. Previous co-morbidities were inquired. A specially designed proforma was used to document data. All the cases received antibiotics, steroids and fluids during admission according to the hospital treatment protocol for COVID-19 infection. As per indication, patients were administered invasive mechanical ventilation or Oxygen via a non-rebreathing mask. The hospital didn't have any non-invasive ventilation equipment during this time period.

Data were analysed by SPSS version 26. Frequency and percentage calculated for qualitative variables (i.e., gender, type of symptom, co-morbidities, etc), mean and standard deviation calculated for quantitative variables (i.e., age, duration of symptoms, duration of hospital stay, etc.). The association of various variables (i.e., gender, age, co-morbidities, duration of symptoms) with mechanical ventilation was assessed by Chi-square test with significant $p<0.05$. Data is presented in the form of tables, pie charts and bar graphs.

Results

Data of 54 cases were collected that expired in BBH from 1st March to 13th June. 42 (78%) males expired as

compared to 12 (22%) females. The mean age was 54.24±12.78 years (20-77 years). The age group greatly affected was in the range 51-60 years (Figure 2). 13 (24%) of patients died without any chronic disease. 41 (76%) patients had various co-morbidities. Amongst these, Diabetes had the highest observed frequency in 31 cases (57.4%), followed by Hypertension in 29(53.7%). Other co-morbidities were ischemic heart disease 11 (20.4%). Stroke, cancer, chronic obstructive airway disease and hypothyroidism in < 10% (Figure 3). All the cases had a history of respiratory symptoms upon hospital presentation. The main cause of death was acute respiratory distress syndrome due to COVID-19. Two patients out of the 54 died of sepsis and multiorgan failure.

The mean duration of illness was 13±7.55 days (2-45). Mean hospital admission was 8±7.28 days (1-41). Duration of illness and hospitalization of age group 51-60 years of age was the longest. This was approximately 16 days of illness and hospitalization of 10 days before the mortality. The age range of 20-30 years had the shortest duration of illness of 7 days and hospitalization of 2 days before death.

Total 35 (64%) of patients received mechanical ventilation and 19(35.2%) of patients had maximum therapy of non-rebreather mask with 15 litres of oxygen (Figure 4). The mean duration of an invasive mechanical ventilator was about 2.89±6.05 days (1-41). The mortality climbed up significantly from 14 (25.9%) to 31 (57.4%) from April to May and then reduced to 9 (16.7%) in June 2020. There was an association of mechanical ventilation with gender (p=0.027), however, mechanical ventilation wasn't significantly associated with co-morbidities, duration of symptoms or age ***(p>0.05; Table 1).***

Table 1: Table representing the demographic variables and comorbidities in relation to mechanical ventilation in COVID related deaths (n=54)

Variable	*Amongst all n=54*	*Invasive mechanical ventilation*	*Non-rebreathing mask*	*p-value*
Gender				
• Males	42 (78%)	18 (42.9%)	24 (57.1%)	*0.027*
• Females	12 (22%)	01 (8.3%)	11 (91.7%	
Age (years)	54.24±12.78	53.4+12.8	55.7+12.9	*0.517*
Diabetes	31 (57.4%)	21 (67.7%)	10 (32.3%)	*0.601*
Hypertension	29 (53.7%)	18 (62%)	11 (37.9%)	*0.649*
IHD	11 (20.4%)	6 (54.5%)	5 (45.5%)	*0.424*
Carcinoma	01 (1.9%)	01 (2.9%)	0 (0%)	*0.457*
CVA	03 (5.6%)	1 (33.3%)	02 (66.7%)	*0.240*
Days of illness	13±7.55	14±8.15	11±6.14	*0.224*

(Test of significance Chi-square, student t-test; significant p<0.05)

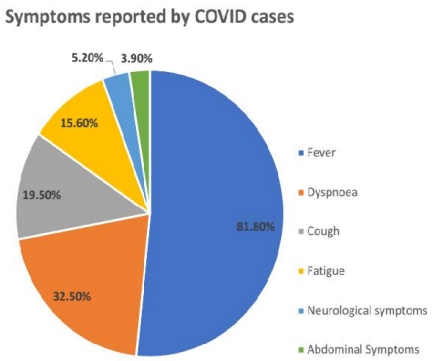

Figure 1: The common presenting symptoms reported by COVID-19 patients (n=54)

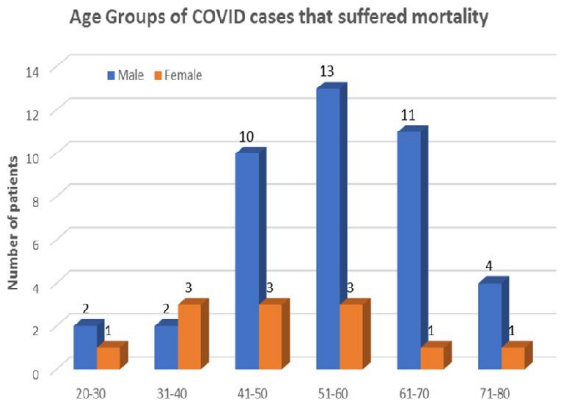

Figure 2: Bar graph representation of COVID cases that suffered mortality with respect to age groups and gender (n=54)

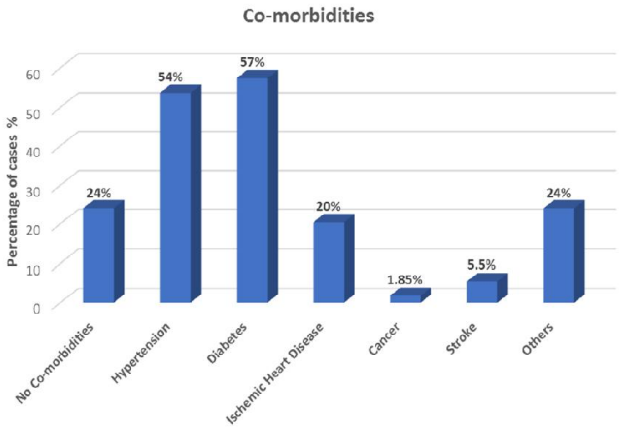

Figure 3: Bar graph presentation of Co-morbid conditions in COVID cases that suffered mortality (n=54)

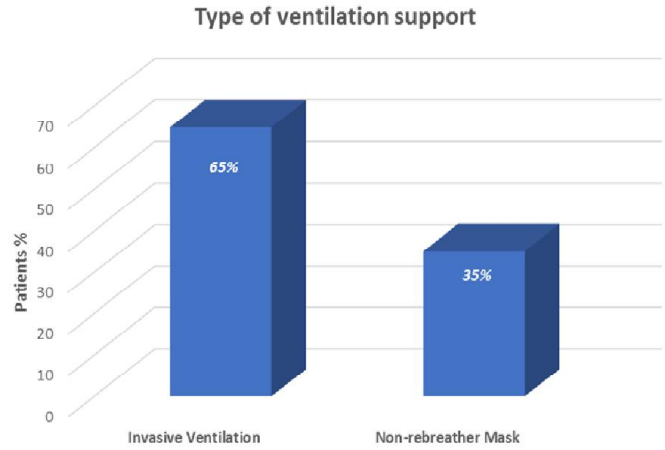

Figure 4: Bar graph presentation of type of ventilation support in COVID cases that suffered mortality (n=54)

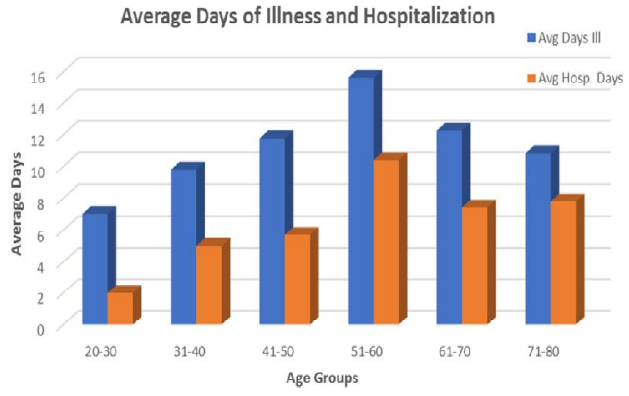

Figure 4: Bar graph presentation of average days of symptoms and the average hospital stay till mortality in COVID cases that suffered mortality (n=54)

Discussion

This data from the public sector hospital highlights that the males were much more affected by the severity of disease as compared to females. This might be due to the greater exposure of the male gender which point towards the social lifestyle difference or lack of equal access to the hospital in the female group. A meta-analysis by Bekham et al also reported that though there isn't any difference in the proportion of males and females with confirmed COVID-19, however, males have three times the odds of requiring the intensive care unit (ICU) management.[9] The previous coronavirus outbreaks (i.e., SARS-COV-1 and MERS) also have shown increases mortality among males.[10,11] These gender-based differences are attributed to socioeconomic factors, the protective effect of oestradiol in females and differences in immune response between males and females.

Regarding the age group, the maximum number of deaths was observed among cases between 40-70 years of age. There were eight expiries of less than forty years of age. This indicates that age $\geq$ 40 years to be considered high risk for mortality. The data from Korea[12] and Italy[13] has demonstrated that > 80% of deaths have occurred in the elderly particularly above 70 years of age. In our study, we observed maximum mortality in the age group 51-60 years. Hence, in our cases, middle-aged cases were also found to be at high risk of mortality in addition to the geriatric age group.

Regarding the initial symptoms at presentation, fever was observed in approx. 80% cases followed by cough, shortness of breath and fatiguability. The fewer number of cases had neurological or abdominal symptoms. This data was from early 2020 when these symptoms were typically seen in COVID, however currently in 2021 newer strain of the COVID-19 virus has been identified that has atypical symptoms including abdominal pain, vomiting, rash and conjunctival congestion. This evolution of symptoms suggests that during an epidemic higher clinical suspicion is required to timely diagnose this highly infectious and lethal disease.

Regarding co-morbidities, diabetes and hypertension were frequently observed in cases that suffered mortality. This may reflect the regional prevalence of diabetes and hypertension in the age group above 40 years that was the most affected age group in this study. Also, we can infer that the presence of diabetes and hypertension in the COVID cases may be a risk factor for complications and mortality. Hence, all COVID cases need to be screened for these co-

morbidities for a better outcome. There were 24% of deaths without any pre-existing comorbidity. This indicates that even perfectly healthy cases are prone to complications and death. A study conducted by Paul Novosad et al[14] compared the comorbidities associated risk of mortality between the UK and India and found that the COVID-19 health risk factors (i.e., diabetes, hypertension, chronic respiratory diseases, obesity, cancer and chronic heart diseases) are not expected to have a major effect on mortality or its age distribution.

The invasive mechanical ventilation was administered in 64% of cases and most of these cases were male patients. Most of the female patients received the oxygen via a non-rebreather mask. There was a strong association of the male gender with the need for mechanical ventilatory support. There could be certain explanations for this. e.g., males being more severely affected by COVID-19 because of more outdoor exposure and social reasons in our country. We didn't have a record of the history of smoking in our patients, but regional data show a higher prevalence of smoking among males as compared to females that could be the contributory factor for the need for ventilatory support. Research data shows 56% mortality in patients requiring invasive mechanical in ICU.[15]

Pakistan is a developing country and the COVID-19 pandemic has greatly affected an overstretched-overcrowded low resourced public hospital that has been thriving on the edge in normal circumstances. Lack of resources like Non-invasive ventilatory machines and limited ventilators were one of the major challenges faced by the COVID team. 35% of the deaths were observed in cases that were given 15 litres of oxygen via a non-rebreather mask as maximum support. Certain COVID cases deteriorated suddenly and the last-minute intubation and ventilation couldn't revive them. Also, despite the utilization of all possible resources and efforts, there was high mortality. This points towards the need to upgrade the human resource as well as equipment quantitatively as well as qualitatively for better outcomes. During Pandemic Pakistan is facing an economic crisis and in view of the fragile health care system and limited resources of critical care, a coordinated and directed plan of action is required.[16]

Another interesting analysis on the duration of illness and duration of hospitalization was done to see the average time period of illness in which patients came to the hospital and the resources required in terms of the number of days of hospitalization. There was a delay in presentation of the younger age group as reflected by the shorter duration of stay in the hospital before dying. Lack of proper pre-hospital care and sensitization to the seriousness of Pandemic might be a few factors of people not presenting earlier to the hospital. The older group had a greater number of hospitalization days comparatively which gives a clue to maximize resources for the coming months of the ongoing pandemic.

There hasn't been sufficient time since the onset of this epidemic to understand this highly contagious and lethal virus. The guidelines for COVID are yet in evolution and may take several years. The study had multiple limitations like the data did not include the patients who died in the Emergency Department who were hospitalized but awaiting beds for shifting. The patients included in this study were only the ones with COVID-19 positive swabs on PCR which has a sensitivity of 60%. This implies that the actual mortality would be much higher than the one seen in this study. Secondly, the peak was yet to come, the cases were on the rise during the study and disease trends might differ in the later months. Despite all these limitations, the current study provides the regional mortality related data that can be helpful and serve as the guide for better risk assessment of COVID cases and may serve as a basis for future studies.

Conclusion

COVID-19 claims significantly high mortality. The risk factors for mortality being age above 50 years, male gender, co-morbidities like diabetes, hypertension, ischemic heart disease, need for mechanical ventilation upon admission and longer duration of illness. There is a need to intensify the vaccination and prevention in the community keeping in mind these high-risk groups. The high-risk cases need to be aggressively managed to reduced mortality and improve outcomes.

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