IDWeek 2022 Poster # 258: Comparison of Different COVID Waves During COVID-19 Pandemic
A Retrospective Study from a Designated COVID-19 Facility of Karachi, Pakistan

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1. Objectives

To compare the clinical characteristics and outcomes of hospitalized COVID-19 patients admitted in different COVID waves (2nd-5th COVID waves)

2. Introduction

Prevalence Of COVID-19

Cases Reported Globally

Confirmed cases
611M
Deaths
6.52M

Cases Reported in Pakistan

Confirmed cases
1.57M
Deaths
30,604

COVID-19 waves in Pakistan

Wave 1st
Confirmed cases
296,149
Deaths
6,298
March, 2020 to August, 2020

Wave 2nd
Confirmed cases
250,279
Deaths
5,385
Oct, 2020 to Jan, 2020

Wave 3rd
Confirmed cases
376,396
Deaths
9,167
Mar, 2021 to May, 2021

Wave 4th
Confirmed cases
350,736
Deaths
7,606
July, 2021 to Sept, 2021

Wave 5th
Confirmed cases
251,413
Deaths
1,903
Nov, 2021 to Mar, 2022

Wave 6th
Jun, 2022-August 2022

3. Material & Methods

Study Design:

- Single-center retrospective study
- Included **3190 COVID patients** who were admitted at **Sindh Infectious Diseases Hospital & Research Center, Karachi,** Pakistan from **Oct 2020-Mar 2022**
- Patients >16 years of age who tested positive for COVID on nasopharyngeal/oropharyngeal swabs on polymerase chain reaction (PCR) were included
- Patients who had a hospital stay of < 24 hours were excluded

Statistical Analysis:

- Kruskal-Wallis test was used to check the normality of the data
- Fisher's and Chi-square were used for categorical data.
- P <0.05 was considered statistically significant. An estimate of the Odds ratio (OR) and 95% confidence interval is also reported. All P-values are two-sided and are shown without adjustment for multiple testing.
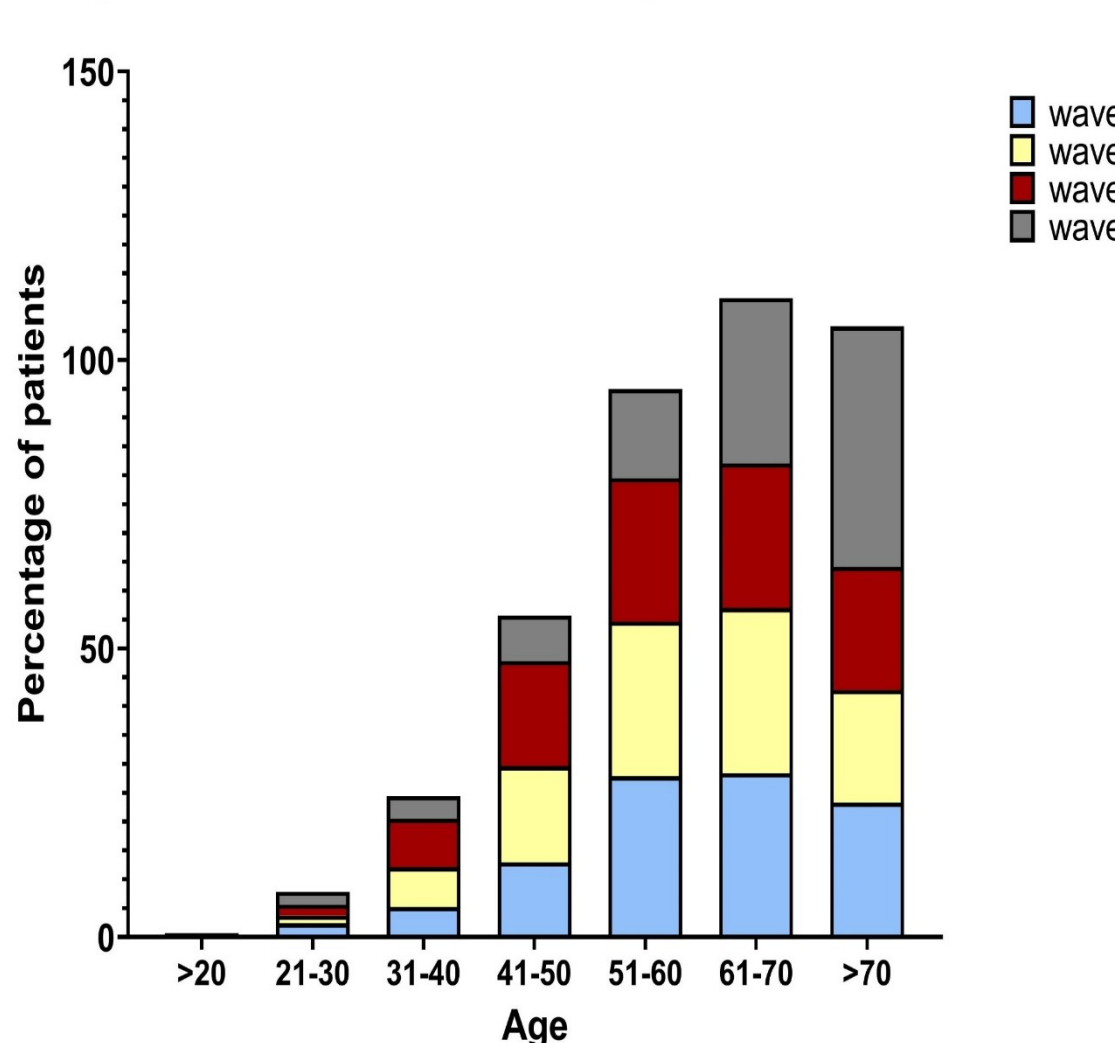- All outcomes were analyzed completely with no missing data

4. Results

From Oct 2020-Mar 2022, 3190 COVID-19 patients were admitted. Each wave had some unique characteristics compared to other waves

- **Second wave:** Highest percentage of discharges compared to mortality (81%,p-value 0.0001) and subcutaneous emphysema (1.5%, p-value 0.0001)
- **Third wave:** Increased frequency of Cytokine Release Syndrome (CRS) (32.7%,p-value 0.0001) and pneumothorax (1.7%, p-value 0.0001)
- **Fourth wave:** Highest number of severe COVID at the time of admission (79.4%,p-value 0.0001), highest intubations (27.1%, p-value 0.0001), septic shock (24.3%,p-value 0.0001) and disease progression (50.8%, p-value 0.0001)
- **Fifth wave:** Elderly patients, median age of 68 (IQR 60-79) years and mild COVID admissions (22.4%, p-value 0.0001); majority having comorbidities (84.6%, p-value 0.0001) and acute kidney injury (29.2%,p-value 0.0001)
- **Mortality was lowest in the second wave (18.9%, p-value 0.0001) while its highest in the fourth wave (42.5%, p-value 0.0001; OR 3.18 CI 2.6-3.8 compared to second wave)**

Table 1: Demographics of 3190 Hospitalized COVID-19 Patients with Comparison of Waves

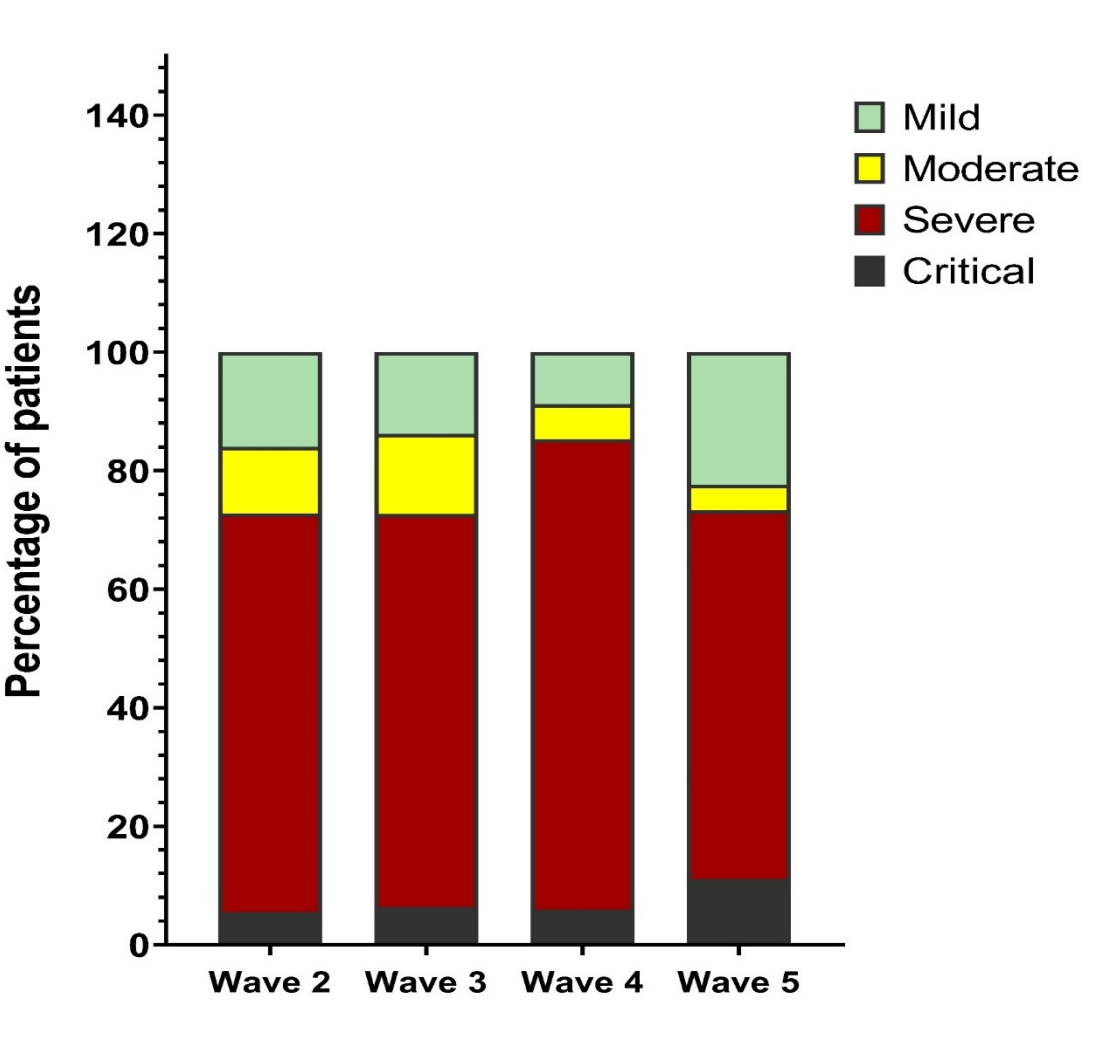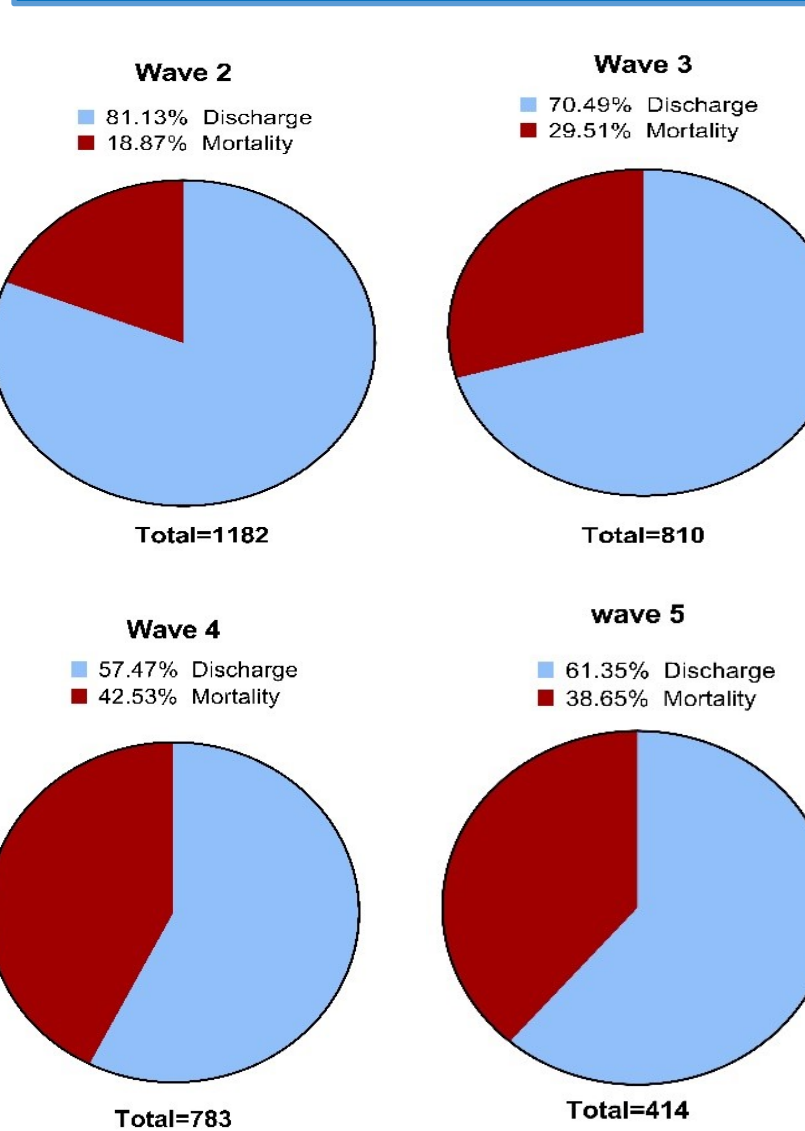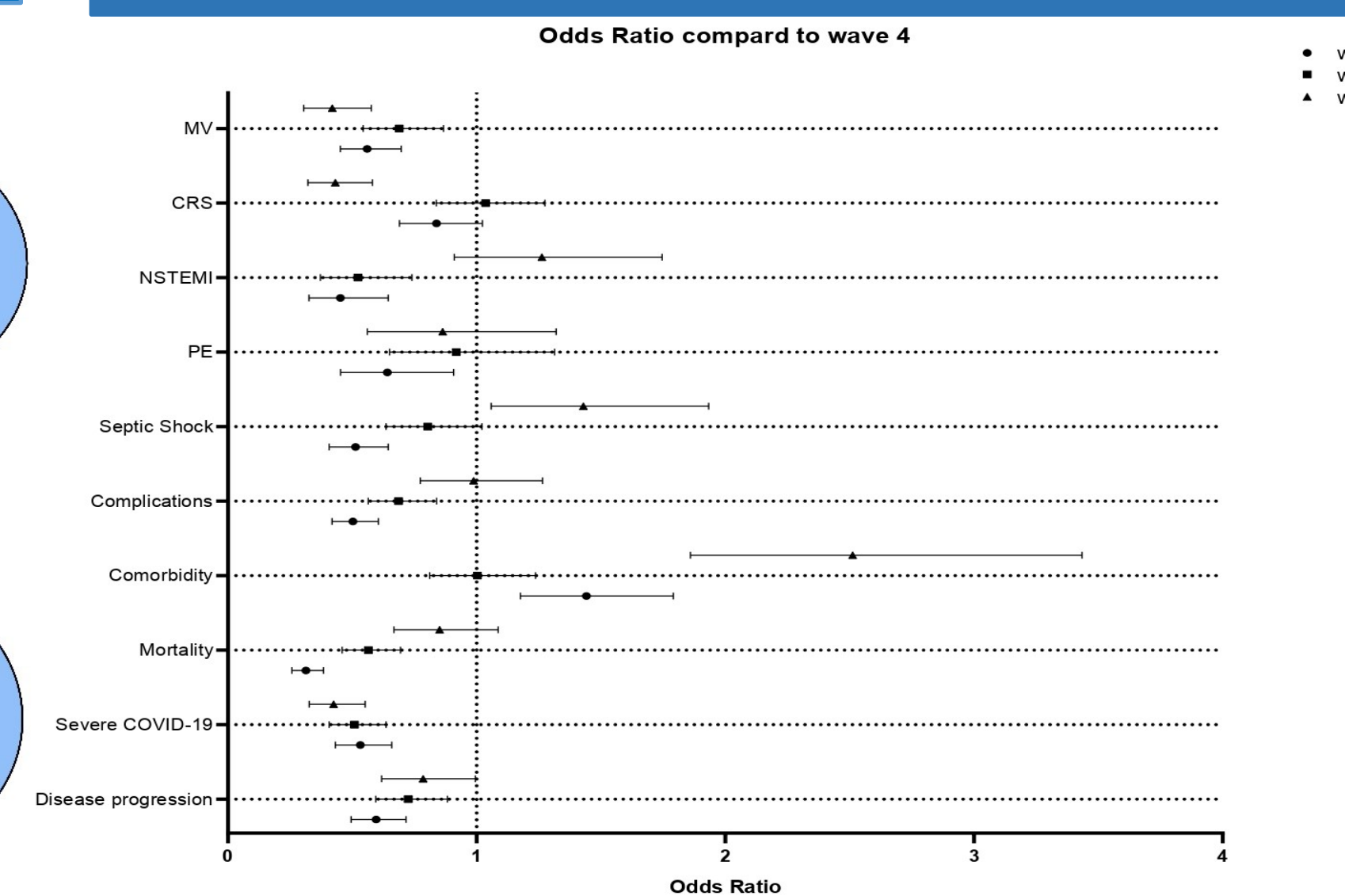| Parameters	All n=3190 (%)	Wave 2 n=1182 (37.1)	Wave 3 n=810 (25.4)	Wave 4 n= 783 (24.5)	Wave 5 n=415 (13)	p-value Overall	Wave 2 vs Wave 3	Wave 2 vs Wave 4	Wave 2 vs Wave 5	Wave 3 vs Wave 4	Wave 3 vs Wave 5	Wave 4 vs Wave 5
Age median (IQR)	62 (52-70)	62 (53-70)	60 (50-70)	60 (50-70)	68 (60-76)	<0.0001	0.219	0.009	<0.0001	0.661	<0.0001	0.0001
Male	1933 (60.6)	766 (64.8)	520 (64.2)	417 (53.3)	230 (55.4)	<0.0001	0.425	<0.0001	0.0124	<0.0001	<0.0001	0.0044
Comorbidity	2341 (73.4)	897 (75.9)	556 (68.6)	537 (68.6)	**351 (84.6)**	<0.0001	0.0004	0.0004	0.0002	1	<0.0001	<0.0001
COVID Disease Category On Admission n (%)												
Mild	463 (14.5)	189 (16)	112 (13.8)	69 (8.8)	**93 (22.4)**		0.202	0.0001	0.0044	0.002	0.0002	0.0001
Moderate	305 (9.6)	132 (11.2)	**109 (13.5)**	46 (5.9)	18 (4.3)	0.0001	0.1246	0.0001	0.0001	0.0001	0.0001	0.282
Severe	2213 (69.4)	796 (67.3)	537 (66.3)	**622 (79)**	258 (62.2)		0.682	0.0001	0.0618	0.0001	0.1642	0.0001
Critical	209 (6.6)	65 (5.5)	52 (6.4)	46 (5.9)	**46 (11.1)**		0.4378	0.7649	0.0003	0.6775	0.0053	0.0019
Death	955 (29.9)	223 (18.9)	239 (29.5)	**333 (42)**	160 (38.6)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0016	0.216

Table 2: Comparison of Clinical Characteristics, Complications and Outcome of different COVID waves

Parameter	Wave 2nd Vs Wave 3rd — Odds Ratio (CI)	Wave 2nd Vs Wave 4th — Odds Ratio (CI)	Wave 2nd Vs Wave 5th — Odds Ratio (CI)	Wave 3rd vs Wave 4th — Odds Ratio (CI)	Wave 3rd vs Wave 5th — Odds Ratio (CI)	Wave 4th vs Wave 5th — Odds Ratio (CI)
Male	0.9 (0.7-1.1)	1.2 (1.1-1.2)	1.337 (0.53-1.6)	1.57 (1.29-1.9)	**2.23 (1.75-2.84)**	1.41 (1.12-1.8)
Co-morbidities	**1.4 (1.2-1.7)**	**1.4 (1.2 -1.8)**	0.6 (0.42-0.7)	1.0 (0.81-1.2)	0.39 (0.29-0.54)	0.4 (0.29-0.53)
Severe COVID	1.1 (0.8-1.3)	0.5 (0.4-0.66)	1.2 (0.497-1.5)	0.50 (0.4-0.63)	1.19 (0.93-1.52)	**2.35 (1.8-3.06)**
Critical COVID	0.8 (0.6-1.2)	0.9 (0.63-1.4)	0.46 (0.3-0.6)	**1.09 (0.7-1.6)**	0.55 (0.37-0.8)	0.50 (0.3-0.77)
ICU Stay	1.0 (0.9-1.2)	0.8 (0.63-0.9)	0.8 (0.64-1.0)	0.8 (0.65-0.9)	0.8 (0.66-1.0)	**1.06 (0.83-1.4)**
Mechanical ventilation	1.2 (0.9-1.5)	0.56 (0.4-0.7)	1.3 (0.97-1.8)	0.7 (0.54-0.8)	1.64 (1.1-2.2)	**2.38 (1.7-3.2)**
Inotropes	**1.4 (1.0-1.7)**	0.5 (0.42-0.6)	0.64 (0.49-0.8)	0.7 (0.55-0.8)	0.87 (0.6-1.1)	1.24 (0.9-1.6)
Cytokine Release Syndrome	0.8 (0.6-0.9)	0.84 (0.7-1.0)	1.9 (1.46-2.5)	1.04 (0.83-1.3)	**2.4 (1.7-3.2)**	2.31 (1.7-3.1)
NSTEMI	1.2 (0.8-1.5)	0.4 (0.32-0.6)	0.45 (0.3-0.6)	0.5 (0.37-0.7)	0.52 (0.3-0.7)	0.79 (0.5-1.0)
Septic Shock	1.5 (1.2-1.9)	0.51 (0.4-0.6)	0.73 (0.54-0.9)	0.8 (0.64-1.02)	1.15 (0.8-1.55)	**1.4 (1.05-1.9)**
Pulmonary embolism	**1.4 (1.0-2.0)**	0.6 (0.45-0.9)	0.74 (0.47-1.1)	0.9 (0.6-1.3)	1.06 (0.6-1.6)	1.06 (0.6-1.6)
AKI	**1.6 (1.3-2.0)**	0.5 (0.42-0.6)	0.41 (0.31-0.5)	0.8 (0.67-1.0)	0.66 (0.5-0.8)	0.77 (0.5-1.0)
Pneumothorax	0.8 (0.3-2.2)	0.6 (0.26-1.3)	1.4 (0.39-4.7)	0.52 (0.19-1.3)	1.2 (0.3-4.3)	**2.3 (0.6-7.6)**
Subcutaneous Emphysema	0.8 (0.4-1.8)	1.3 (0.61-3.0)	6.4 (1.15-67.3)	1.07 (0.44-2.6)	5.2 (0.90-56.4)	6.9 (1.1-74.7)
Disease progression	1.2 (1.0-1.4)	0.6 (0.5-0.7)	0.75 (0.60-0.9)	0.7 (0.59-0.8)	0.92 (0.7-1.1)	**1.27 (1.0-1.6)**
Discharged	1.8 (0.7-2.2)	**3.18 (2.6- 3.8)**	2.7 (2.120-3.4)	1.76 (1.4-2.1)	1.50 (1.1-1.93)	0.85 (0.66-1.1)
Mortality	0.5 (0.4-0.7)	0.3 (0.2-0.38)	0.4 (0.28-0.4)	0.6 (0.46-0.6)	0.66 (0.5-0.85)	1.2 (0.92-1.5)

Age Distribuation according to COVID-19 Waves

Disease category at the time of admission

Mortality Rate In Each Wave

Wave 2 — 81.13% Discharge, 18.87% Mortality, Total=1182
Wave 3 — 70.49% Discharge, 29.51% Mortality, Total=810
Wave 4 — 57.47% Discharge, 42.53% Mortality, Total=783
wave 5 — 61.35% Discharge, 38.65% Mortality, Total=414

Foster Plot Comparing Odd Ratio of Wave 2,3 and 5 with Wave 4

5. Discussion

Fourth wave was the deadliest wave which was driven by delta variant of COVID-19. Delta variant is associated with more severe disease and a higher risk of hospitalization.

In the fifth wave, mostly hospitalized patients were elderly with a lesser degree of disease severity as compared to other waves. This low disease severity can be explained either by higher vaccination or by low virulence of the Omicron variant which had emerged in this wave.

6. Conclusion

Each COVID wave has certain distinct characteristics compared to other waves. Second wave had the least mortality while the fourth wave had the highest mortality. Third wave was associated with CRS while in fifth wave mostly elderly people were hospitalized with increased frequency of Mild COVID hospitalizations owing to comorbidities.

7. References

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