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Trends in hospitalization and mortality in COVID-19 admitted patients after a single dose of vaccine

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ABSTRACT

Background: Several types of vaccines are available across the world. Efficacy in preventing disease or reducing severity in terms of hospitalization, morbidity, and mortality needs to be studied in vaccinated patients, as most of them fail to prevent COVID-19 infections. **Aims and Objectives:** We aimed to correlate the disease severity and impact of a single dose of vaccine in COVID-19 breakthrough infections. **Materials and Methods:** The present study included 348 COVID-19 patients admitted to a tertiary hospital in Telangana, India, from March to August 2021 (and divided into an elderly group as Group 1 and a middle-aged group as Group 2 according to the vaccination protocol). Data were taken from the medical records of patients retrospectively regarding demographic and clinical details, as well as vaccination status during their hospital stay. **Results:** Diabetes mellitus and hypertension were found to be prevalent together as comorbidities (40%) in patients with prolonged hospitalization and 36% in those with severe disease (assisted ventilation). In vaccinated groups, irrespective of age, prolonged hospitalization was drastically halved (PR = 0.418 for Group 1 and PR = 0.416 for Group 2). Overall mortality in Group 1 is 2 times more frequent than in the Group 2 (odds ratio = 2.12). Overall, prolonged hospital stays need for ventilatory support and deaths were also 2 times more common in men than in women. **Conclusion:** Older age, male gender, and more than one comorbidity are the most important factors determining poor clinical outcomes in persons with breakthrough severe acute respiratory syndrome coronavirus 2 infection, whereas vaccination is associated with a strong protective effect.

Key words: COVID-19; Diabetes; Hypertension; Severe disease; Unvaccinated patients; Vaccinated

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INTRODUCTION

The corona virus disease called COVID-19 is a well-known pandemic disease (according to World Health Organization 2020).[1] The first COVID-19 case was identified in India on January 30, 2020, and gradually, cases increased within a few months in a wave pattern. In India, the first wave was seen from April 2020 until the end of that year. To effectively combat the disease, global health agencies quickly responded to the pandemic by developing vaccines. Along with efficacy, adverse reactions and safety protocols have been evaluated. The initial vaccines and their efficacy, once established, were given to front-line healthcare workers like doctors, intensive care specialists, and nursing staff. In Italy, there was a study on healthcare workers administering the first dose of the BNT162b2 vaccine and they had reduced symptoms and faster viral clearance even within six days of vaccine administration.[2] In India, after adequate field trials, COVID vaccination commenced on January 16, 2021, nationwide initially for front-line workers and the

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elderly who are 60 years of age and above.[3] Vaccination was facilitated subsequently for the age group of 45–60 within 2–3 months. The vaccines (Covishield and Covaxin) were developed in India and administered through government hospitals and some designated centers.

The second pandemic wave appeared from March to August 2021 with little chance of the population getting a second vaccine dose. Hence, the majority of patients admitted in wave 2 had a breakthrough infection (COVID infection after the 1st or 2nd dose of vaccination). With such a large population, the Government of India mandated that all hospitals admit and treat COVID-19 patients in respiratory distress according to proper protocols and guidelines. A large group of patients needed hospitalization with varied comorbidities and varied vaccination statuses in our hospital during the second wave period. Many centers reported higher mortality amongst patients with comorbidities (Diabetes Mellitus [DM] and Hypertension [HTN]).

One of the concerns during hospitalization was the demand for oxygen supplementation, assisted ventilation and a lack of bed availability due to prolonged treatment days. In a study by Alguwaihes et al., the mean average time from diagnosis to discharge was found to be 10 days.[4] Taking the duration as standard time, any hospitalization exceeding or equal to the average time (10 days) has been considered "prolonged (morbidity)" in our study. It is essential to know the burden and effective management of beds during a pandemic. Similarly, there were patients admitted to the COVID ward who took a single dose of vaccination and yet got hospitalized with varied comorbidities. What type of safety and benefits does this national vaccination program offer? To evaluate the efficacy of a single dose of vaccine in our patients, a retrospective analysis has been undertaken.

According to the Indian Council of Medical Research guideline (clinical management protocol for COVID-19, Ministry of Health and Family Welfare), disease severity is graded, and hypoxic patients who need mechanical ventilation are considered to have the severe disease.[5] In our study, those patients who needed mechanical ventilation were considered as having severe disease. To effectively plan treatment measures and address the shortfalls in the availability of medical resources (medications, intensive care unit [ICU] beds, availability of oxygen, ventilators, and human power), studies are needed to evaluate morbidity (prolonged hospitalization and severe disease) and mortality. Unless studies are undertaken comprehensively, handling pandemics like COVID-19infections may pose great challenges in the future. A detailed retrospective analysis of hospitalized patients was thus carried out at our tertiary care hospital.

Aims and objectives

1. Assessment of morbidity and mortality in COVID-19 affected partially vaccinated hospitalized patients
2. To determine the impact of vaccination on assisted ventilation.

The objectives:

1. To determine the risk of diabetes as a comorbidity in hospitalized patients with reference to prolonged hospitalization
2. To determine the risk of HTN as a comorbidity in hospitalized patients with reference to prolonged hospitalization
3. To determine the risk of both diabetes and HTN as comorbidities in hospitalized patients with reference to prolonged hospitalization
4. To determine the impact of vaccination on the requirement for assisted ventilation in both groups
5. To determine the risk of diabetes as a comorbidity in hospitalized patients with reference to mortality
6. To determine the risk of HTN as a comorbidity in hospitalized patients with reference to mortality
7. To determine the risk of both diabetes and HTN as comorbidities in hospitalized patients concerning mortality.

MATERIALS AND METHODS

The retrospective and descriptive study was conducted on hospitalized patients of Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection wave 2 (March to August 2021) in our tertiary care hospital of Telangana state in India after getting approval from an institutional human ethics committee.

Inclusion criteria

The COVID-19 hospitalized patients with positive reverse transcription polymerase chain reaction reported any one condition, like abnormal changes in high resolution computed tomography lung fields or abnormality of D-dimer levels or saturation <95%, the age group of 45 years and above (According to the vaccination protocols), and male and female patients were included in the study.

Exclusion criteria

The following criteria were excluded from the study:

- Children
- Hospitalized patients of 44 years and below
- Pregnancy and lactating women
- Malignancy patients with or without chemoradiation
- HIV and HBsAg-positive patients

Data on demographic and clinical details, as well as vaccination status, were collected retrospectively from

patient's medical records during their hospital stay. The data collected included demographics, comorbidities, vaccination status, need for ventilatory support, deaths, and survival status.

Sample size

As per our inclusion and exclusion criteria, 348 patients were included in the study from admitted patients during the second wave.

Statistical analysis

The collected data were tabulated in a Microsoft excel sheet and analyzed. To measure the statistical significance, the Chi-square test was performed wherever applicable. To understand the existence of an association between morbidity and risk factors such as age, vaccination, and comorbid conditions, we calculated the risk ratios. However, this is not a randomized clinical study, but the intervention happened, so we can study the efficacy of the intervention and get valid conclusions.

RESULTS

The number of cases fluctuated upward from April 2021 to August 2021. The number of patients admitted was 515 in the second wave. As per our inclusion criteria, 348 patients were taken into consideration and divided into two groups. Sixty-one years and above patients were included in Group 1 (Elderly). The second group included patients who were between 45 and 60. Each group is further stratified into vaccinated and unvaccinated.

The total number of patients in the study was 348, of which 127 patients were in Group 1, and 221 patients were in Group 2. Forty-one were vaccinated (single dose) in Group 1 whereas 68 were vaccinated in Group 2. The study is limited to single-dose vaccinated patients only. In this study, 232 patients were male (66.6%), and 116 (33.3%) were female. Of vaccinated patients, 75 were male, whereas 34 were female. Out of 109 vaccinated patients, 41 were in Group 1 and 68 were in Group 2. Thus, 239 were unvaccinated, of them 86 were in Group 1 and 153 were in Group 2. DM, HTN, and both (DM and HTN) were considered as comorbidities in the study. Comorbidities were observed in 96 patients of Group 1 of which 33 were vaccinated and 63 were unvaccinated. Similarly, comorbidities in Group 2 were 139, of which 47 were vaccinated and 92 were unvaccinated. Patients without any comorbidities were 113, of which 31 were in Group 1 and 82 in Group 2 (Table 1).

Eighty-three patients had prolonged hospitalization, in which 32 were in Group 1 and 51 in Group 2. In both groups, male preponderance was observed. DM and HTN together were found to be prevalent among prolonged hospitalized patients (Table 2).

Twenty-six out of 86 unvaccinated, as against six out of 41 patients had prolonged hospitalization in Group 1. In Group 2, 43 out of 153 unvaccinated patients and eight out of 68 vaccinated had prolonged hospitalization (Table 3).

The number of patients ventilated was 49 (38.5%) and 53 (24%) in Group 1 and in Group 2 respectively (PR=1.6). In Group 1 patients, 39 out of 49 ventilated had comorbidities, with 37 patients being unvaccinated. In Group 2, 34 out of 53 had comorbidities and 42 were unvaccinated. It is observed that out of 41 vaccinated (Group 1), 12 required ventilatory support whereas 11 out of 68 required ventilatory support in Group 2 (Figure 1).

Ninety-five deaths were observed out of 348 patients. The details of deaths were given in Group 1 and Group 2 with reference to vaccination status. In Group 1, 12 out of 47 were vaccinated, whereas, in Group 2, 10 out of 48 were vaccinated. Twenty-one (44.6%) out of 47 (Group 1), 14 (29.1%) out of 48 (Group 2) had more than one comorbidity (Table 4).

Table 1: Clinical characteristics of patients under study

Characteristics	Group 1 (n=127)		Group 2 (n=221)	
	Vaccinated (n=41; 32), n (%)	Unvaccinated (n=86; 67.7), n (%)	Vaccinated (n=68; 30.76), n (%)	Unvaccinated (n=153; 69.2), n (%)
Male: Female ratio	28:13	55:31	47:21	102:51
ENT symptoms	20 (51)	45 (52.3)	46 (67.6)	100 (65.3)
Oxygen usage	28 (68.2)	79 (67.9)	52 (76.4)	125 (81.69)
Prolonged stay	6 (14.6)	26 (30.2)	8 (11.76)	43 (28.1)
Case fatality rate	12 (29.2)	35 (40.6)	10 (14.7)	38 (24.8)
Assisted ventilation	12 (29.2)	37 (43)	11 (16.17)	42 (27.45)
Comorbidities				
DM only	4 (9.7)	17 (19.76)	16 (23.5)	37 (24.1)
HTN only	11 (26.82)	18 (20.93)	11 (16.1)	21 (13.72)
DM and HTN	18 (43.9)	28 (32.5)	20 (29.4)	34 (22.22)

HTN: Hypertension, DM: Diabetes mellitus

In Group 1, 29.2% of deaths were vaccinated and 40.7% were unvaccinated whereas, in Group 2 (middle-aged), they were 14.7% and 24.8%. In unvaccinated, 40.7% and 24.8% deaths were observed in Group 1 and Group 2, respectively. While considering results within each group, the mortality in the unvaccinated people was found to be 40.7% and 24.8% in Group 1 and Group 2, respectively (Table 5).

DISCUSSION

In this descriptive cohort study, it was observed that male patients (65% in the elderly group and 67% in the middle-aged group) were twice more common as females. Mishra et al., reported a male predominance of 70.8% out of 445 patients,[6] Khan et al., reported 70.25% (n=845)[7] whereas Butt et al., reported from Qatar 60.7% (n=456) male preponderance in hospitalized patients.[8] In the present study, 31.2% were vaccinated with a male preponderance of 68.8%. A study by Teran et al., reported 23% being partially vaccinated among 627 patients.[9] However, the same study has given a female preponderance (61.4%) of vaccinated patients.

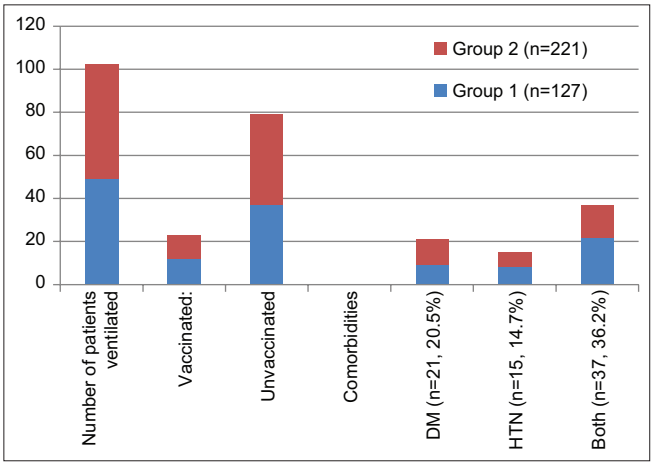

Figure 1: Details of ventilatory support in both groups

Table 2: Morbidity (Prolonged hospitalization) details in both groups

Characteristics	Group 1 (n=127), n (%)	Group 2 (n=221), n (%)	PR
Prolonged stay	32 (25.2)	51 (23.7)	1.06
Male: Female ratio	20:12	36:15	
Comorbidities			
DM	4 (12.5)	14 (27.4)	0.456
HTN	8 (25)	3 (5.88)	4.31
Both	14 (43.75)	19 (37.25)	1.18

*PR: Prevalence ratio, HTN: Hypertension, DM: Diabetes mellitus

Overall, 100 patients have both comorbidities (28.7%). In single comorbidity, diabetes 74 (21.2%) had a high prevalence whereas HTN was found in 61 patients (17.5%). In other studies, HTN as a comorbidity was found to be the highest prevalence, 16.9% in Guan et al.,[10] and 30% in a retrospective cohort study from Wuhan, by Zhou et al.[11] In the same study, the most common comorbidities of COVID-19 patients were HTN (30%), diabetes (19%), and 8% coronary heart disease. Both comorbidities (DM and HTN) were found to be more in the non-survivors in our study, similar to the above study. In the present study, diabetes was observed in 21% of patients. Alguwaihes et al.,[4] reported a high prevalence of 68% DM in 439 of their subjects. It was also associated with high rates of obesity in the general population.

The majority of the COVID-19 vaccines are able to induce (neutralizing antibodies) against the spike protein, which helps to protect vaccinated individuals from viral infection.[12] Efficacious COVID-19 vaccines can rapidly alert the immune system to produce protective antibodies against the virus and reduce the duration of hospitalization due to infection.[13]

In our study, prolonged hospitalization in the elderly group is similar to that of middle-aged (25% vs. 23%) (PR=1.09). The influence of age on prolonged hospitalization is almost similar in both groups. In this study, among Group 1 vaccinated and unvaccinated patients, the prolonged hospitalization was apparently reduced to 14.6% against 30.2%. The difference is, however, statistically not significant (σ=3.579, CI=95%). However, there seems to be a borderline significance and probably this is due to a low number of cases.

In middle-aged patients (Group 2), the prolonged hospital stay was 28.1% in the unvaccinated whereas it was 11.76% in the vaccinated, which was statistically significant (σ=7.07, CI=99%). Thus, it seems to be reasonable to

Table 3: Details of prolonged hospitalization in vaccinated patients in both groups

Group	Vaccinated		Unvaccinated		Characteristics		
	Total	Prolonged stay, n (%)	Total, n (%)	Prolonged stay, n (%)	PR	σ	CI (%)
Group 1	41	6 (14.6)	86 (67.7)	26 (30.2)	0.483	3.58	95
Group 2	68	8 (11.76)	153 (69.2)	43 (28.1)	0.416	7.07	99

PR: Prevalence ratio, CI: Confidence interval

Table 4: Mortality details in both groups

Characteristics	Mortality (n = 95)		PR
	Group 1 (n = 47), n (%)	Group 2 (n = 48), n (%)	
Number (alive)	80 (62.9)	173 (78.2)	
Number (deaths)	47 (37)	48 (21.71)	1.7
Male: Female ratio	28:19	33:15	
Vaccinated: Unvaccinated	12:35	10:38	
Comorbidities	37	30	
DM	8 (17)	10 (20.8)	0.817
HTN	8 (17)	6 (12.5)	1.36
Both	21 (44.6)	14 (29.1)	1.53

PR: Prevalence ratio, HTN: Hypertension, DM: Diabetes mellitus

Table 5: Details of mortality and survival in relation to vaccination in both groups

Group	Deaths/alive (95/253)		Total
	Vaccinated	Unvaccinated	
Group 1	12/29	35/51	47/80
Group 2	10/31	38/115	48/173
OR	1.28	2.07	2.12

*OR: Odds ratio

assume that in vaccinated groups, irrespective of age, prolonged hospitalization was drastically halved.

There was not much difference regarding hospitalization between unvaccinated (20%) and partially vaccinated (18%) skilled nursing facility residents and staff members in a study done by Teran et al.[9] However, the study did not take the duration of stay for prolonged hospitalization.

Elderly people with HTN had 4 times the chances of prolonged hospitalization. For patients with diabetes or both comorbidities, the risk is similar in both groups for prolonged hospitalization. In both groups, 102 patients (29.3%) needed ventilatory support. It is similar to another Asian study in Saudi Arabia, with 60 (30.2%) patients by EL-Kady et al.,[14] and 17.5% in a study by Alguwaihes et al.[4] In our study, 15 out of 102 (14.7%), ICU admissions were hypertensives, whereas a heightened number of hypertensive ICU admissions in Italy (49%) and in Sweden (34%) were present according to European center for disease prevention and control (ECDC).[15] In our study, 21 out of 102 (20.5%) were diabetic ICU admissions and, according to ECDC, it is 32% in the USA, 23% in Sweden, and 17% in Italy had a previous history of diabetes. Similarly, El-Kady et al., reported 20% of diabetic ICU admissions.[14] About 36.2% of ICU admissions had both diabetes and HTN in our study.

The need for assisted ventilation in the elderly is more for unvaccinated (41.86%) than for vaccinated (29.2%). However, the difference is not statistically significant (σ=1.84). In middle-aged patients, the need is more for unvaccinated (27.4%) than vaccinated (16%), it seems to be significant (CI=90–95%, σ=3.27) that the need is reduced by the single shot of vaccination. While considering unvaccinated patients from our study, it is observed that the prevalence of assisted ventilation is found to be higher in elderly patients (38.5%, PR=1.6). The demand for increased ventilatory support in the elderly is probably due to ageing or reduced vital capacity due to pulmonary inflammation.

Overall, deaths observed were 95 out of 348 (27%) in our study, almost similar to the study (28%) done by Zhou et al.,[11] but the sample was taken from patients 18 years and above. Similarly, 55 deaths (27.6%) were seen in a Saudi Arabian study by EL-Kady et al.,[14] The highest mortality was observed in Italy (53.4%),[16] the USA (39%),[17] and Spain (30.5%),[18] from reports obtained. The case fatality rate in the elderly group patients was found to be 37% whereas it was 21% in the middle-aged (prevalence ratio: 1.7). Elderly people had 1.7 times more risk of mortality than the middle-aged group. The risk is reduced 4 times in the middle-aged (27–7%) and 2 times in the elderly (55–26%) with vaccination in a study by Butt et al.[8] Overall mortality in the elderly group (group 1) is 2 times more often seen than in the middle-aged group (odds ratio=2.12). While comparing the mortality in the unvaccinated, the likelihood of death is twice more often seen in the unvaccinated than vaccinated (odds ratio=2.07) and regarding the mortality in the vaccinated group, the elderly were found to be marginally at risk (odds ratio=1.28). The gross reduction in a ratio (from 2.07 to 1.28), when compared to unvaccinated and gross values, is due to vaccination. Once vaccinated, age is no longer a contributing factor to mortality.

Increased risk of mortality is seen in the elderly who were unvaccinated and associated with a combination of comorbidities (DM and HTN, PR=1.53). When considering single comorbidity as a cause of death, hypertensive patients were found to have enhanced risk (PR=1.36). When it is considered for diabetes, there is no marked difference in the risk of mortality between the elderly and middle-aged (PR=0.817).

Overall, prolonged hospitalization, need for ventilatory support, and deaths are also 2 times more common in males than in females (67%prolonged stay, 63.7% assisted ventilation, and 64% deaths in the total sample). The same is observed in a meta-analysis by Pijls et al.,[19] and Li et al.[20]

Limitations of the study

The study was conducted in a single center only. Patients were partially vaccinated. Even though the vaccination program started early and in the initial days, many people

did not get the chance. It may be because of a huge population or fear of vaccine-induced complications.

CONCLUSION

The present study is an attempt to evaluate the demand for ventilatory support, hospital stay (morbidity), and mortality in vaccinated and unvaccinated patients of COVID-19 after a single dose. Increasing age was strongly and independently associated with a higher risk of severe disease or death even in persons with breakthrough infection. Irrespective of age, the duration of hospitalization can be reduced even with a single dose of vaccination. In summary, increasing age, male gender, and more than one comorbidity are the most important factors determining poor clinical outcomes in persons with breakthrough SARS-CoV-2 infection, while vaccination is associated with a strong protective effect. Older persons who develop a breakthrough infection, particularly those with any symptoms, should be quickly evaluated and monitored for severe outcomes.

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REFERENCES

1. Cucinotta D, Vanelli M (2020) WHO declares COVID-19 a pandemic? Actabio-medica: Atenei Parmensis 91(1): 157–160.
2. Coppeta L, Balbi O, Grattagliano Z, Mina GG, Pietroiusti A, Magrini A, et al. First dose of the BNT162b2 mRNA COVID-19 vaccine reduces symptom duration and viral clearance in healthcare workers. Vaccines (Basel). 2021;9(6):659.
   https://doi.org/10.3390/vaccines9060659
3. Rackimuthu S, Hasan MM, Bardhan M and Essar MY. COVID□19 vaccination strategies and policies in India: The need for further re-evaluation is a pressing priority. Int J Health Plann Manage. 2022;37(3):1847-1850.
   https://doi.org/10.1002/hpm.3321
4. Alguwaihes AM, Al-Sofiani ME, Megdad M, Albader SS, Alsari MH, Alelayan A, et al. Diabetes and Covid-19 among hospitalized patients in Saudi Arabia: A single-centre retrospective study. Cardiovasc Diabetol. 2020;19(1):205.
   https://doi.org/10.1186/s12933-020-01184-4
5. Ministry of Health and Family Welfare, Government of India. Clinical Management Protocol COVID-19. New Delhi: Ministry of Health and Family Welfare, Government of India; 2020.
6. Mishra V, Burma AD, Das SK, Parivallal MB, Amudhan S and Rao GN. COVID-19-hospitalized patients in Karnataka: Survival and stay characteristics. Indian J Public Health. 2020;64(6):S221-S224.
   https://doi.org/10.4103/ijph.IJPH_486_20
7. Khan M, Khan H, Khan S and Nawaz M. Epidemiological and clinical characteristics of coronavirus disease (COVID-19) cases at a screening clinic during the early outbreak period: A single-centre study. J Med Microbiol. 2020;69(8):1114-1123.
   https://doi.org/10.1099/jmm.0.001231
8. Butt AA, Nafady-Hego H, Chemaitelly H, Abou-Samra AB, Al Khal A, Coyle PV, et al. Outcomes among patients with breakthrough SARS-CoV-2 infection after vaccination. Int J Infect Dis. 2021;110:353-358.
   https://doi.org/10.1016/j.ijid.2021.08.008
9. Teran RA, Walblay KA, Shane EL, Xydis S, Gretsch S, Gagner A, et al. Postvaccination SARS-CoV-2 infections among skilled nursing facility residents and staff members-Chicago, Illinois, December 2020-March 2021. Am J Transpl. 2021;21(6) :2290-2297.
   https://doi.org/10.1111/ajt.16634
10. Guan WJ, Liang WH, Zhao Y, Liang HR, Chen ZS, Li YM, et al. Comorbidity and its impact on 1590 patients with COVID-19 in China: A nationwide analysis. Eur Respir J. 2020;55(5):2000547.
    https://doi.org/10.1183/13993003.00547-2020
11. Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: A retrospective cohort study. Lancet. 2020;395(10229):1054-1062.
    https://doi.org/10.1016/S0140-6736(20)30566-3
12. Chakraborty S, Mallajosyula V, Tato CM, Tan GS and Wang TT. SARS-CoV-2 vaccines in advanced clinical trials: Where do we stand? Adv Drug Deliv Rev. 2021;172:314-338.
    https://doi.org/10.1016/j.addr.2021.01.014
13. Zhang JJ, Dong X, Liu GH and Gao YD. Risk and protective factors for COVID-19 morbidity, severity, and mortality. Clin Rev Allergy Immunol. 2022;64(1):90-107.
    https://doi.org/10.1007/s12016-022-08921-5
14. El-Kady AM, Aldakheel FM, Allemailem KS, Almatroudi A, Alharbi RD, Al Hamed H, et al. Clinical characteristics, outcomes and prognostic factors for critical illness in hospitalized COVID-19 patients in Saudi Arabia: A retrospective cohort study. Int J Gen Med. 2022;15:6945-6963.
    https://doi.org/10.2147/IJGM.S374090
15. European Centre for Disease Prevention and Control. Rapid Risk Assessment: Novel Coronavirus Disease 2019 (COVID-19) Pandemic: Increased Transmission in the EU/EEA and the UK-eighth Update. Sweden: European Centre for Disease Prevention and Control; 2020.
16. Grasselli G, Greco M, Zanella A, Albano G, Antonelli M, Bellani G, et al. Risk factors associated with mortality among patients with COVID-19 in intensive care units in Lombardy, Italy. JAMA Intern Med. 2020;180(10):1345-1355.
    https://doi.org/10.1001/jamainternmed.2020.3539
17. Cummings MJ, Baldwin MR, Abrams D, Jacobson SD, Meyer BJ, Balough EM, et al. Epidemiology, clinical course, and outcomes of critically ill adults with COVID-19 in New York City: A prospective cohort study. Lancet. 2020;395(10239): 763-1770.
    https://doi.org/10.1016/S0140-6736(20)31189-2
18. Goicoechea M, Cámara LA, Macías N, de Morales AM, Rojas AG, Bascuñana A, et al. COVID-19: Clinical course and outcomes of 36 hemodialysis patients in Spain. Kidney Int. 2020;98(1):27-34.
    https://doi.org/10.1016/j.kint.2020.04.031
19. Pijls BG, Jolani S, Atherley A, Derckx RT, Dijkstra JI,

Franssen GH, et al. Demographic risk factors for COVID-19 infection, severity, ICU admission and death: A meta-analysis of 59 studies. BMJ Open. 2021;11:e044640.
https://doi.org/10.1136/bmjopen-2020-044640

20. Li J, Huang DQ, Zou B, Yang H, Hui WZ, Rui F, et al. Epidemiology of COVID-19: A systematic review and meta-analysis of clinical characteristics, risk factors, and outcomes. J Med Virol. 2021;93(3):1449-1458.
https://doi.org/10.1002/jmv.26424

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TBR- Concept and design of the study, results interpretation, review of literature and preparing first draft of manuscript; **UP-** Concept and design of the study, drafting the article, revision of manuscript and statistical analysis; **SK-** Analysis and interpretation of the data, setting of references and revision of manuscript; **NP-** Concept and design of the study, results interpretation, made critical revisions and approved final version; **UKP-** Interpretation of the data, review of literature, supporting in setting of references

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