Universal health care access for all residents reduce mortality in COVID-19 patients in Abu Dhabi, UAE: A retrospective multicenter cohort study

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Universal health care access for all residents reduce mortality in COVID-19 patients in Abu Dhabi, UAE: A retrospective multicenter cohort study

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Abstract

Background: SARS-CoV-2 was first reported in December 2019. The severity of COVID-19 infection ranges from being asymptomatic to severe infection leading to death. The aim of the study is to describe the clinical characteristics and outcomes of hospitalized COVID-19 patients within the largest government healthcare facilities in the Emirate of Abu Dhabi, the capital of UAE.

Methods: This paper is a retrospective cross-sectional study of all patients admitted to Abu Dhabi Healthcare services facilities (SEHA) between the period of March 1st until May 31st with a laboratory-confirmed test of SARS-CoV2, known as Coronavirus disease (COVID19). Variation in characteristics, comorbidities, laboratory values, length of hospital stay, treatment received and outcomes were examined. Data was collected from electronic health records available at SEHA health information system.

Results: There were 9390 patients included; patients were divided into severe and non-severe groups. 721 (7.68%) patients required intensive care while the remaining majority (92.32 %) were mild-moderate cases. The overall age (41.8 years) is less than the mean age reported globally. Our population had a male predominance and variable representation of different nationalities. Three major comorbidities were noted, hypertension, diabetes mellitus and chronic kidney disease. The laboratory tests that were significantly different between the severe and the non-severe groups were LDH, Ferritin, CRP, neutrophil count, IL6 and creatinine level. The major antiviral therapies the patients have received were a combination of hydroxychloroquine and favipiravir. The overall in hospital mortality was 1.63% while severe group mortality rate was 19.56 %. The Death rate in the adults younger than 30 years was noted to be higher compared to elderly patients above 60 years, 2.3% and 0.9 % respectively.

Conclusion: our analysis suggests that Abu Dhabi had a relatively low morbidity and mortality rate and a high recovery rate compared to published rates in China, Italy and The United States. The demographic of the population is younger and has an international representation. The country had the highest testing rate in relation to the population volume. We believe the early identification and younger demographic had affected the favorable comparative outcome in general with early identification of cases leading to a lower mortality rate.

Key words: COVID-19, Clinical features, disease severity, mortality, outcome

Introduction

Coronavirus disease (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was first reported in December 2019. The severity of COVID-19 infection ranges from being asymptomatic to severe infection leading to death (1). On March 11th, 2020, The World Health Organization (WHO) announced the emergence of a new MERS-CoV2 virus pandemic (2) and on January 29th, 2020, the United Arab Emirates (UAE) had officially reported the first case of COVID-19 (3). As of August 14th, 2020, the estimated total number of cases in UAE is 63,819 cases and the mortality cases reported is 359 with wide spread testing reaching 5,851,453 tests done covering almost 60% of UAE population (4). Globally, the world total number of cases are estimated to be more than 18 million cases and mortality cases exceeding 800,000 deaths (2). The outcomes of patients treated for COVID-19 from UAE have not been reported in the literature. Anecdotally, the patients are faring better compared to the west. We have younger patients of wide range of nationalities with less comorbidities and these factors may have contributed to our relatively better outcomes. Surprisingly, children are noted to have less severe symptoms and much better outcomes compared to adult cases. However, children have a rare presentation of a serious condition called multisystem inflammatory syndrome, which constitutes of multi-organ failure (5). Significant differences have been noted in the clinical and demographic features of COVID-19 patients in different regions of the world (6). We wish to analyze patients' characteristics, the impact of our current therapeutic options and patient clinical outcomes.

We report hospitalizations and intensive care admissions from Abu Dhabi Health services (SEHA), the largest government health care provider in the Emirate of Abu Dhabi, UAE. It serves three regions; western, eastern and middle region of Abu Dhabi, with an estimated per annum encounters of 5 million for both in-patient and out-patient services (7). We gathered the electronic data from 5 major hospitals. The UAE is considered one of the countries having the highest testing rate for COVID-19 averaging more than 50,000 test per day across all regions. The country leadership took a very early initiative to assure full accessibility of all individuals to testing and needed medical care regardless of their insurance coverage plan. All SEHA facilities were following the National Guidelines for Clinical Management and Treatment of COVID-19 unified by all health regulatory bodies issued by UAE ministry of health and prevention (8) (9).

Methods

Study design

This is a retrospective observational cross-sectional study of adults hospitalized at any of SEHA's healthcare facilities, who tested positive for nasal swabs for SARS-CoV-2 by polymerase chain reaction (PCR) between March 1st, 2020 and May 31st, 2020. We characterized patients by baseline demographics, comorbidities, severity of illness, laboratory parameters, respiratory support and therapies used. Outcomes like survival, length of hospital stay and viral clearance were evaluated accordingly. UAE National guidelines for treatment of pneumonia and acute respiratory distress syndrome (ARDS) caused by SARS-CoV-2 were followed (8) and for the intensive care management, the national guidelines for critical care were followed (9).

Inclusion and exclusion criteria

All in-patients diagnosed with COVID-19 in SEHA hospitals between the period of March 1st till May 31st, 2020 in Abu Dhabi. The age group included were all hospitalized adult patients aged 18 years and above. We excluded pediatric patients. Admitted patients with an ongoing COVID-19 prior to study dates were excluded from analysis.The groups were divided into severe and non-severe based on the need for admission to intensive care unit (ICU) or high dependency unit (HDU) across all SEHA hospitals

Data collection and variables

The data were sourced from hospital information system and relevant data for all COVID-19 patients who were admitted to SEHA hospitals within the study period was extracted.

The data extraction process was based on the documentation and handled through Cerner team located in the UAE in addition to SEHA corporate Health Information System application analysts. The variables that were considered for the study included age, gender, comorbidities, lifestyle habits, signs and symptoms, assessment at admission and laboratory values collected on within the first 24 hours of admission. Outcome measures includes, status of the patient (recovered or died), duration of admission, viral clearance and type of medications used. Sample of the study was further divided based on level of care provided and the need for ICU or HDU admission and mechanical ventilation to two groups; severe or non-severe infection. Due to the large amount of data included in the study and the nature of descriptive studies, we have not performed any imputation for missing data, and describe the data as they stand.

Statistical analysis

Baseline characteristics are summarized using descriptive statistics including mean, median, interquartile range (IQR) and standard deviation (SD) for continuous measures, and frequencies tables for categorical variables. Categorical variables will be compared using the chi square or Fisher's exact test and continuous variables using the unpaired t-test or its non-parametric equivalent. Statistical significance was set at p value ≤ 0.05 (two-sided). The data analysis was performed using STATA statistical software version 12.0

The data is further analyzed using Time to Event analysis (Survival Analysis). The survival time is the duration of time, from the date of admission, until the date of any event of interest, which is death in this case. In this situation, patients lost-to-follow up or withdrawn from the study will be considered as right censored. Discharge from the hospital will be considered as a competing event. Survival curves of different comorbidities will be compared using the equivalent of log-rank test in the case of competing events.

SARS-CoV 2 detection

SARS-CoV-2 Virus was diagnosed by real-time reverse-transcriptase PCR with detection of the N and ORF1ab gene using the U-Top COVID-19 Detection Kit (Seasun Biomaterials, Daejeon, Korea) or the E and the S gene using the RealStar PCR (Altona Diagnostics, Hamburg, Germany). Interpretation of the result was performed according to the manufacturer's recommendation.

Results

Demographics

The UAE is considered one the highest countries to have COVID-19 testing across its population in all the seven Emirates, with an average test number reaching more than

50,000 tests per day across the country. The Total number of patients admitted to SEHA hospitals in the Emirate of Abu Dhabi over our study period was 9390 patients. We further divided the patients according to their level of medical care and found 721 (7.68%) patients required ICU or HDU admissions, while the remaining majority (92.32 %) with mild-moderate symptoms were admitted to either regular wards at designated SEHA hospitals or quarantine hotels depending on their clinical symptoms. The mean age of our patients was 41.8 years (SD (±11.89 and 95 % CI 41.61, 42.09). Figure 1 shows the mean overall age in our study and the mean age between the severe and non-severe groups ($P<0.001$). The male to female ratio was obvious with a male predominance of 4.9:1.

The baseline demographics and nationality of the patients as described in table 1 and figure 2 demonstrated a higher percentage of Indian patients at 39.12 % followed by Pakistani 13.57% and Bangladeshi 10% patients then Filipino at 8% while the Emirati patients were only 7.3% and the others (14%) were from different 21 nationalities across the globe.

Table 1: baseline demographics

	Overall **n**	**severe** **n (%)**	**Non-severe** **n (%)**
Demographics	**9390**	721 (7.68%)	8669 (92.32%)
Age mean (±SD)	41.85 (±11.89)	44.75 (±13.34)	41.61 (±11.75)
Age group (years)	**n (%)**	**Mean age**	
< 30 years	1718 (18.3%)	26.45	
31-60 years	7007 (74.62%)	43.31	
>60 years	665 (7.08%)	66.16	
Gender	**Overall** **n (%)**	**severe** **n (%)**	**Non-severe** **n (%)**
Female	1598 (17.02%)	133 (18.45%)	1465 (16.9%)
Male	7792 (82.98%)	588 (81.55%)	7204 (83.1%)
Nationality			
Emirati	**688 (7.33%)**	**89 (12.34%)**	**599 (6.9%)**

Non-Emirati	8702 (92.67%)	632 (87.66%)	8070 (93.1%)
Indian	3673 (39.12%)	232 (32.18%)	3441 (39.7%)
Bangladeshi	945 (10.06%)	69 (9.57%)	876 (10.1 %)
Pakistani	1274 (13.57)	102 (14.15%)	1172 (13.5%)
Pilipino	760 (8.09%)	52 (7.21%)	708 (8.2%)
Egyptian	371 (3.95%)	24 (3.33%)	347 (4%)
Nepalese	358 (3.81%)	18 (2.50%)	340 (3.9%)
others	1321 (14.068%)	135 (18.7%)	1186 (13.7%)

Comorbidities and lifestyle

The comorbidities listed in the records are illustrated in table 2 and figure 3. It was found that 75% of the severe cases had at least one comorbidity, and the 3 major ones in the severe group were hypertension (HTN) (32.8%) followed by diabetes mellitus (DM) (27%) and chronic kidney diseases (CKD) (5.6%). In comparison to the mild cases, only 25 % had a comorbidity and HTN was the predominant disease. There was noticeable difference among the severe and non-severe groups with regards to the status of their comorbidities listed namely HTN, DM, and CKD in addition to coronary artery disease (CAD) and malignancy. It is noted that there was no significant difference in lifestyle parameters listed in the medical records. The mean Body Mass Index (BMI) is slightly higher in the severe group but not statistically different (p= 0.5895). The medical records lacked documentation of habits of physical activity for the majority of admitted patients and did not reflect smoking practices among the patients. Regarding chronic pulmonary diseases such as Chronic Obstructive Pulmonary Disease (COPD) and asthma, the percentage in the severe group (2.36%) which was surprisingly too small in comparison to the other group of chronic diseases.

Table 2: Co-morbidities in both groups

	Overall n (%)	Severe n (%)	Non-severe n (%)	P-value
Comorbidities	2259 (26.1%)	542 (75.17%)	2164 (24.93%)	
Diabetes mellitus	857 (9.13%)	195 (27.05%)	767 (8.85%)	<0.0001
Hypertension	887 (9.45%)	237 (32.87%)	791 (9.12%)	<0.0001

COPD	3 (0.03%)	1 (0.14%)	2 (0.02%)	0.095
Asthma	176 (1.87%)	16 (2.22%)	160 (1.85%)	0.477
CAD	89 (0.95%)	16 (2.22 %)	73 (0.84%)	0.0002
Ischemic heart Disease	93 (0.99%)	9 (1.25%)	84 (0.97%)	0.466
CKD	154 (1.64%)	41 (5.69%)	125 (1.44%)	<0.0001
Malignancy	192 (2.57%)	27 (3.74%)	162 (2.40%)	0.0005
Pregnancy	40 (0.43%)	4 (0.5%)	36 (0.4 %)	0.580
Body Mass Index (median, IQR)	26.22 (23.83-29.34)	25.99 (23.88-29.48)	26.23(23.83-29.29)	0.589

Admission assessment

Admission assessment within the first 24 hours of hospital stay was analyzed for all patients. The overall signs and symptoms and vital signs as illustrated in table 3 were within normal limits as an average measurement for the majority but looking at the range it does reflect the spectrum of the severe cases at presentation. Table 4 demonstrates the need for oxygen therapy and mechanical ventilation in addition to the difference in clinical scores between the two groups. We used Sequential Organ Failure Assessment (SOFA) score, Modified Early Warning Score (MEWS) score and Glasgow Coma Score (GCS). The number of cases requiring mechanical ventilation was 106 patients within first 24 hrs suggesting a severe form of presentation of respiratory failure or seeking medical attention very late.

Table 3: admission assessment

Signs and symptoms	**n (%)**
Cough	3156 (51.86%)
Vomiting or diarrhea	177 (1.88%)
Sore throat	871 (24.83%)
Shortness of breath	715 (7.61%)
Vital signs	**median (IQR)**
Temperature (Centigrade)	36.8 (36.7-37.1)
Respiratory Rate (bpm)	18(18-20)
Heart Rate (bpm)	83 (75- 92)
Systolic Blood Pressure (mmHg)	132 (122- 143)

Diastolic Blood Pressure (mmHg)	83 (75-90)
Oxygen Saturation (%)	99 (97-99)

Table 4: admission scores

Respiratory support	**Overall** n (%)			
Mechanical Ventilation	106 (1.42%)			
Oxygen therapy (any form)	386 (5.16%)			
Oxygen flow rate (L/min) Median (IQR)	2 (0-3)			
Scores Median (IQR)	**Overall**	**Severe**	**Non-severe**	**P-value**
MEWS score	0 (0-0)	4 (2-6)	0 (0-0)	< 0.0001
SOFA score	0(0-0)	0 (0-3)	0 (0-0)	< 0.0001
Glasco Coma Scale	14.9 (3-15)	15 (15-15)	15 (15-15)	< 0.0001

Laboratory values

The laboratory values for all admitted patients are summarized in table 5 with the mean values and SD during the first 24 hours of admission. Looking into specific laboratory values and comparing the severe and non-severe groups differences (table 6), it is noted that there is a statistically significant difference in both lymphocyte and neutrophil count but not in the total white blood cell count. Certain inflammatory markers like ferritin, C reactive protein (CRP) and lactate dehydrogenase (LDH) were also significantly different in mild and severe groups ($P<0.0001$). Additionally, Interleukin-6 (IL6), which is a pro-inflammatory marker anticipated to have a major role in predicting progression and severity of COVID-19 was showing significant difference between both groups ($p<0.0001$).

Table 5: mean lab values of all patients

Lab Values (unit)	**Mean (±SD)**
While Blood Cells (x10^9/L)	6.76 (±3.69)
Lymphocyte count (x10^9/L)	1.86 (±2.72)
Neutrophil count (x10^9/L)	4.22 (±2.36)

Haemoglobin (g/dl)	141.84 (±16.91)
Platelet (x10^9/L)	243.10 (±85.65)
Creatinine (micromol/L)	88.32 (±85.61)
Urea (mmol/L)	4.24 (±2.54)
eGFT(ml/min/m2)	97.22 (±23.60)
Albumin (g/L)	38.92 (±6.06)
Sodium (mmol/L)	138.64 (±3.35)
Potassium (mmol/L)	4.10 (±0.45)
Chloride (mmol/L)	100.38 (±3.53)
CO2 (mmol/L)	24.31 (±2.61)
Phosphorus (mmol/L)	1.06 (±0.25)
Correlated Calcium (mmol/L)	2.31 (±0.11)
Glucose (random)	7.26 (±0.13)
HbA1c (%)	7.81 (±2.50)
Magnesium (mmol/L)	0.84 (±0.08)
ALT (U/L)	39.56 (±39.20)
AST (U/L)	35.46 (±31.40)
Bilirubin (micromole/L)	8.92 (±5.80)
Amylase (IU/L)	74.98 (±44.22)
Lipase (IU/L)	47.14 (±47.30)
APTT (sec)	37.54 (±7.94)
PT (sec)	13.30 (±2.55)
INR	1.04 (±0.22)
D-dimer (mg/L)	0.69 (±2.00)
Fibrinogen (g/L)	4.69 (±1.56)
Lactate dehydrogenase (IU/L)	264.46 (±128.50)
Uric Acid (mmol/L)	290.85 (±93.28)
Ferritin (mcg/L)	555.95 (±821.86)
C Reactive protein (mg/L)	29.51 (±53.16)
Interleukin-6 (pg/mL)	158.84 (±734.08)
Arterial pH (mmHg)	7.41 (±0.30)
Arterial pO2 (mmHg)	91.73 (±51.89)

Arterial pCO2 (mmHg)	36.22 (±8.35)
Arterial pHOC3 (mmHg)	23.38 (±3.87)
Arterial Lactate (mmHg)	1.61 (±1.81)

Table 6: laboratory variations among groups

Lab Values	Overall mean (±SD)	Severe mean (±SD)	Non-severe mean (±SD)	P-value
While Blood Cells (x10^9/L)	6.76 (±3.69)	7.02 (±3.98)	6.74 (±3.66)	0.0635
Lymphocyte count (x10^9/L)	1.86 (±2.72)	1.79 (±0.80)	1.89 (±2.84)	0.0056
Neutrophil count (x10^9/L)	4.22 (±2.36)	4.73 (±03.71)	4.17 (±2.17)	< 0.0001
Creatinine (micromol/L)	88.32 (±85.61)	104.78 (±124.10)	86.72 (±80.73)	< 0.0001
HbA1c (%)	7.81 (±2.50)	8.42 (±2.38)	7.77 (±2.50)	0.0591
Lactate dehydrogenase (IU/L)	264.46 (±128.50)	310.10 (±182.50)	259.76 (±120.62)	< 0.0001
Ferritin (mcg/L)	555.95 (±821.86)	768.05 (±1003.73)	534.46 (±798.09)	< 0.0001
C Reactive protein (mg/L)	29.51 (±53.16)	56.55 (±86.87)	26.83 (±47.75)	< 0.0000
Interleukin-6 (pg/mL)	158.84 (±734.08)	472.65 (±1508.39)	78.46 (255.48)	< 0.0000

Outcomes

In our data records, it was noted that in hospital mortality rate was 1.68 %. The severe group mortality rate was 19.56 % compared to 0.2 % in the non-severe group. The mortality across different age groups stratified as in table 7. The majority of patients were between the age 31-60 years and only 6 patients above the age of 60 (3.7%) died. Below the age of 30 years, we noticed a higher proportion of death with a mortality rate of 2.33 %.

The average length of stay for all patients was 6.4 days with a range up to 65 days and the average ICU hospital stay was 7.42 days as oppose to the non-severe group who had an average length of hospital stay of 6.36 days. The difference of hospital stay was statistically significant (P<0.0001). Table 8 demonstrates the mean viral clearance duration calculated from the admission day; which is the day of first positive test till the first negative PCR, was 13.2 days and up to 68 days and was noted in some of the diseased cases some had a positive test till the date of death. There was a statistically significant different in the viral clearance among mild and severe groups, 13 and 15.41 days respectively (P<0.0001).

Survival analysis looking into the event of death based on the three common comorbidities noted in our analysis (DM, HTN, CKD), there was no statistical difference in survival proportion of the three comorbidities after admission to ICU (Figure 4).

Table 7: mortality outcome

	n (%)		
ICU admission	721 (7.68%)		
Mortality	**Overall n (%)**	**Severe n (%)**	**Non-severe n (%)**
	158 (1.68%)	141 (19.56 %)	17 (0.2%)
Age groups	**Mortality n (%)**	**Mortality Rate**	
< 30 years	40 (25.32 %)	2.33 %	
31-60 years	112 (70.89 %)	1.6 %	
60 years	6 (3.7 %)	0.9 %	

Table 8: Hospitals outcome

Days	**Overall Mean (±SD)**	**Severe Mean (±SD)**	**Non-severe Mean (±SD)**	**P-value**
Hospital Length of stay	6.46 (5.27)	7.42 (6.65)	6.36 (5.12)	<0.0001
Viral clearance	13.22 (10.19)	15.41 (10.31)	13.05 (10.17)	<0.0001

Treatment

The antiviral medications used for treatment are illustrated in the table 9, the two major treatment options were Favipiravir and Hydroxychloroquine (HCQ) jointly together.The second line treatment was Camostat and the least antiviral medication used was Lopinavir/ritonavir. There was a limited use of Tocilizumab as it was depending on the indication relevant to an elevated IL6 level in the setting of cytokine storm. We can see 63% of those tested positive received HCQ and the majority received two medications or more, as per the clinical protocol and UAE guidelines medical treatment was offered to all symptomatic patients. The other treatment agents used were steroids, but very limited number of patients have received it as the evidence to support their benefit was primarily published in June (10) which is not included in the period covered in this study. The use of anticoagulation was initiated in middle of March and it is noted that almost half of the patients (47.4 %) received one form of anticoagulation, primarily low molecular weight heparin (Enoxaparin). Some hospitals were using Doxycycline as a presumptive treatment for COVID-19.

Table 9: treatments used in COVID-19 patients

Medications	n (%)
Azithromycin	595 (6.34%)
Camostat	1,094 (11.65%)
Chloroquine	260 (2.77%)
Favipiravir	5,057 (53.86%)
Hydroxychloroquine	5,945 (63.31%)
Lopinavir/ritonavir	849 (9.04%)
Tocilizumab	23 (2.50%)
Steroids *	188 (2%)
Enoxaparin	4359(46.42)
Heparin	102(1%)
Doxycycline	104 (1.1 %)

*Steroids: dexamethasone, methylprednisolone Na succinate, Prednisolone

Discussion

Through our retrospective analysis of the demographic data, we can see we have a wide representation from the Middle East and South Asia through the demographic of the population studied here in Abu Dhabi, which reflects the actual population of

UAE. In comparison to the data published from China and the western countries, we observed a lower overall mean age of 41 years in our population in addition to a younger mean age of mortality cases. The male predominance is similar to the rest of the world and similarly reflecting the actual community of Abu Dhabi.

This data represent hospitalized patients but the indication for hospitalization in March was for all positive cases regardless of their actual symptoms as a measure of quarantine and for monitoring their symptoms. Later in the month of April with the number of positive cases exceeding hospital bed capacity, the decision was made to differ hospitalization in health care facilities and shift to certain dedicated hotels as measure of quarantine isolation. By May, with more awareness of self-quarantine measures the decision by the health authority was to suspend admission of asymptomatic patients.

We believe the results discussed in the study may be affected by the fact that there was a certain percentage of asymptomatic or mild cases in the non-severe group in this data analysis. The data represent the younger population, which is characteristic of the country demographic in age and distribution of nationalities as per The UAE National Bureau of Statistics reported annually.

Since the announcement of the pandemic, medical care was offered to all the population of UAE free of charge, and access was free to all regardless of their status of insurance coverage. Despite this policy, we can see from the data that certain blue-collar workers may have not comprehended the fact that their treatment was free and that may have contributed to the small percentage that presented late to the hospitals after having a prolonged course or severe symptoms at presentation. This observation cannot be verified as the electronic medical records lack the duration of symptoms prior to admission but it was observed from very abnormal vital signs at day one of hospitalization and the need for mechanical ventilation on day one for 106 patients. Despite having significant difference in the percentages of patients affected by the three major comorbidities (HTN, DM, CKD) among the severe and non-severe group, the survival was not affected once the patient is in intensive care setting in this group of patients.

The country's infectious disease experts have developed clinical and intensive care guidelines based on the best available evidence, these guidelines were updated 4 times until the time of writing this paper. At the beginning of the pandemic, treatment options were primarily focused on using HCQ and Lopinavir-Ritonavir Subsequently, with anecdotal observation of lack of improvement and with the evolving evidence from China and Japan Favipiravir was added (11), the two major treatment combinations used were HCQ and Favipiravir as illustrated in the counts of treatment in this population. However, we cannot conclude if they have contributed to a better chance of recovery in this population based on this simple retrospective observation. The other major treatment that was used is anticoagulation prophylaxis and the therapy was adjusted according to the coagulation profile with prophylaxis guidelines which was started in mid of March across SEHA hospitals (based on the critical care counsel at SEHA recommendation as evidence started to suggest there is a hypercoagulable state in COVID19 (12) (13).

In the mortality assessment, the total number of deaths in this cohort is 158 patients. We have a mortality rate of 19.56 % in the sever group admitted to HDU or ICU which is relatively lower than published data (14) (15). If we stratify the mortality by age group, the majority of deceased patients were below the age of 60 years; 152 cases (89.9%) and only 6 cases were 60 years or above (0.9%). It is observed that the younger age group of less than 30 years had a higher mortality rate compared to the elderly. The exact reason for this observation cannot be explained using retrospective observation data and will require further analysis in this age group.

Currently there are no available framed laboratory abnormalities directly related to COVID19 (16). From the review of the variables in laboratory findings electronically, we can see a clear difference in a certain set of labs as illustrated in table 5 and 6. This suggests that certain laboratory sets can be significantly different between mild to severe cases. Those labs were the neutrophil count rather than low lymphocyte count, CRP level, LDH, Ferritin, IL6 and creatinine level suggesting the predisposition of renal diseases and as well the risk of acute renal failure. There is emerging evidence suggesting that the neutrophil-lymphocyte count ratio is a possible predictor of severity in COVID19 patients (17). These set of labs can serve as a predictive tool for severity but will require further correlation assessment.

Conclusions

This retrospective descriptive analysis suggests that Abu Dhabi had a relatively low morbidity and mortality rate and a high recovery rate compared to published rates in China, Italy and United States. The demographic of the population is younger and has an international representation of a multinational population assessment of COVID risk factors and outcome, which is characteristic of UAE. The risk of diabetes,

hypertension and chronic renal failure did not affect the outcome at ICU level. The country had the highest testing rate in relation to the population volume. The wide spread screening for COVID 19 has led to early identification of cases and relatively better outcome with a lower mortality rate. Both early identification and younger demographic had affected the favourable comparative outcome in general with early identification of cases leading to a lower mortality rate. There is a lower average age of mortality in Abu Dhabi but more awareness is needed, as the mortality in young adults in our population is higher than the elderly.
Certain set of labs do predict severity of the disease, we identified LDH, IL6, Ferritin, neutrophil count and creatinine level. The major two antiviral combinations used jointly in Abu Dhabi were Hydroxychloroquine and favipiravir, however through retrospective studies we cannot conclude efficacy through this observation.

Declarations

Ethics approval and consent to participate Institutional Review Board (IRB) approval was obtained through the National COVID-19 IRB committee on June 6th, 2020 with reference number (CVDC-10-06/2020-10-1). Informed Consent was waived for this research because of the nature of the study which is retrospective chart review of unidentified data.

Consent for publication: Not applicable

Availability of data and material: The data that support the findings of this study are available from Health information System department at Abu Dhabi Health services, but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of Abu Dhabi health services and Abu Dhabi Department of health.

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Authors' contributions: NK, AN and MH: literature search, figures, study design, data collection, data analysis, data interpretation and writing. JA, TK, HG, Ak, SW and OH: data interpretation, writing

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Figure legends

Figure 1: Box Plot of mean age and IQR in all overall patients, severe and non-severe groups.

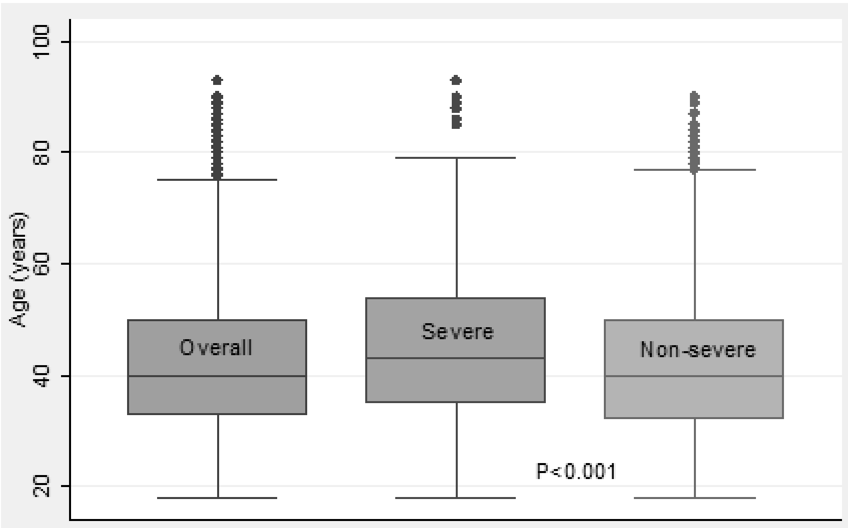


Figure 2: Nationality distribution among severe and non-severe group

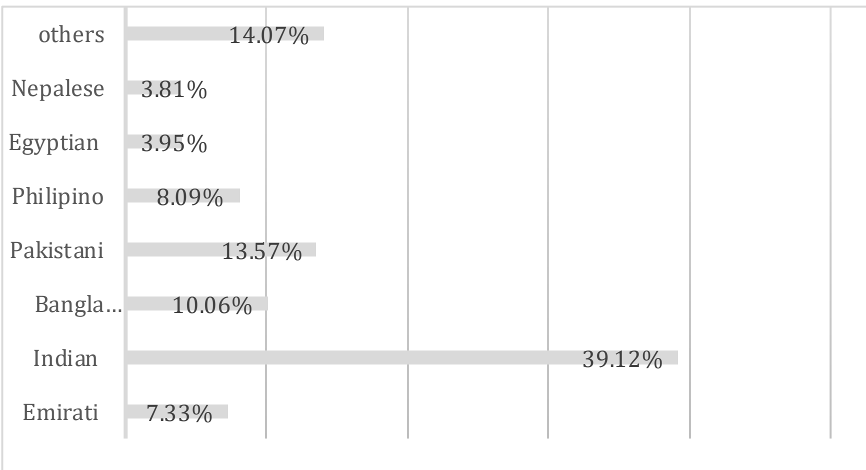


Figure 3: proportion of co-morbidities among severe and non-severe groups

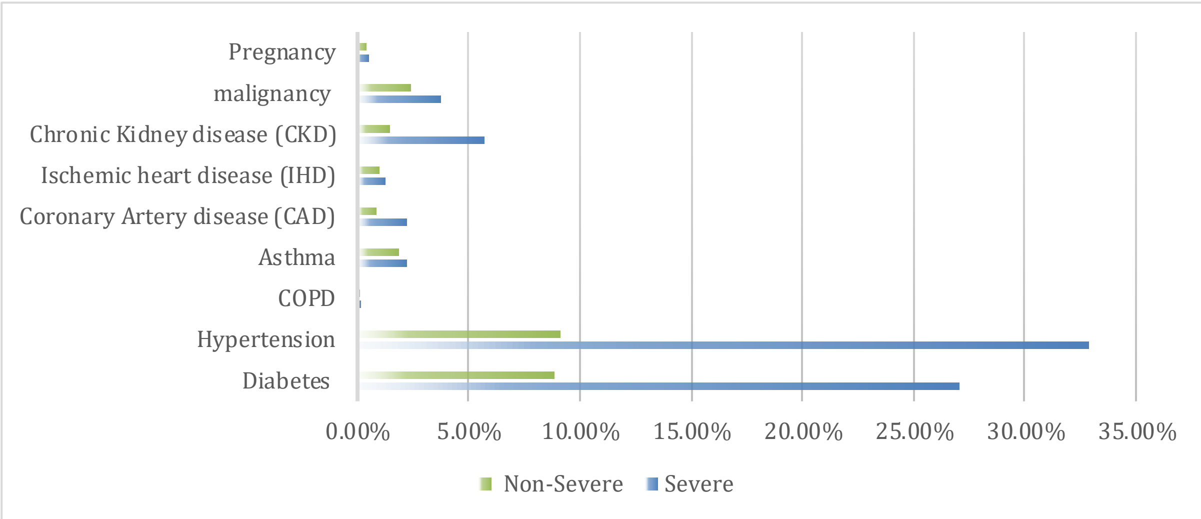
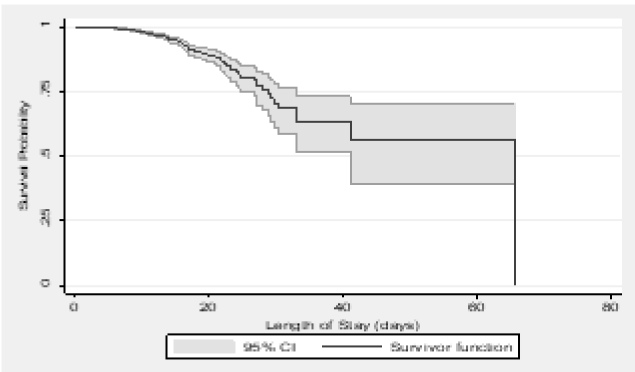
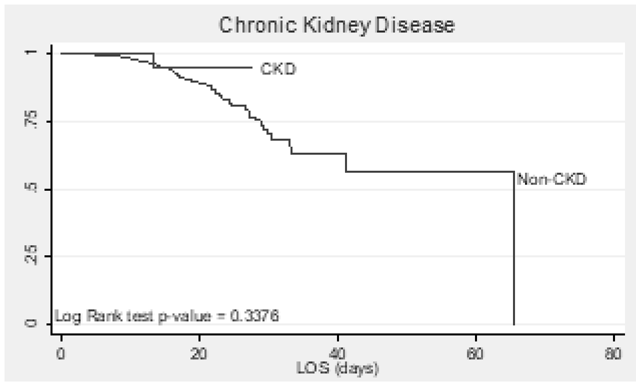


Figure 4: Survival Estimate
Kaplan-Meier survival analysis: A. overall all patients B,C,D. comparison between the three major comorbidities between among all patients.

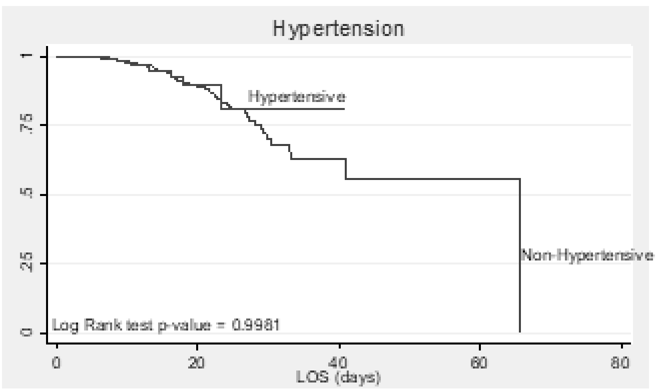
A. Overall



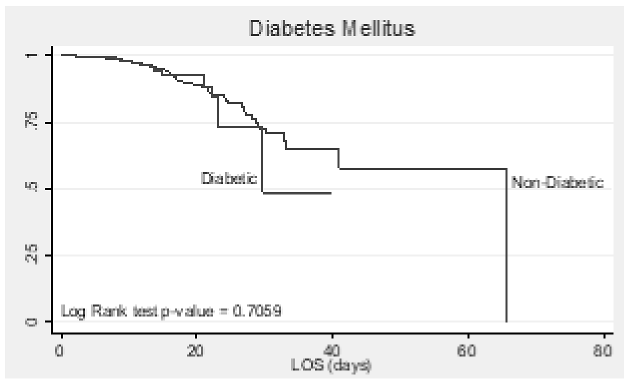
B. DM



C. HTN



D. CKD



Figures

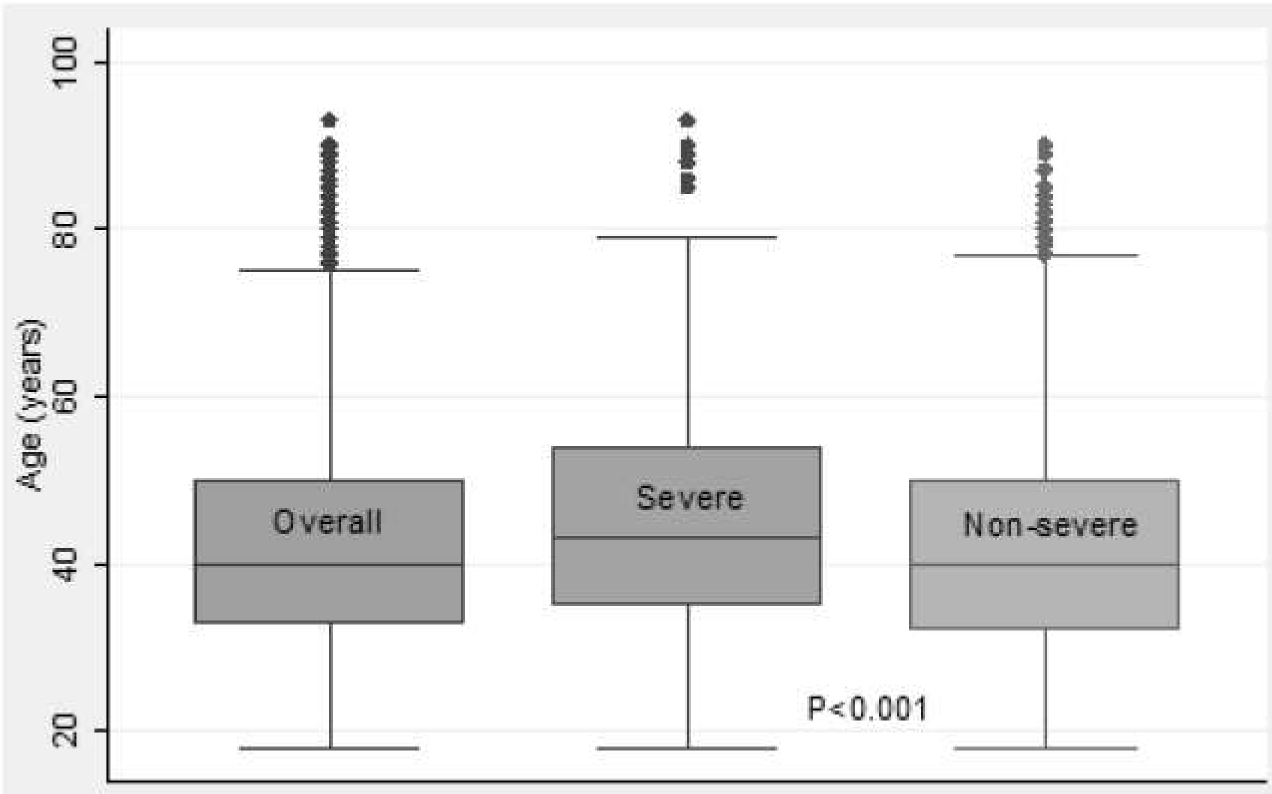


Figure 1

Box Plot of mean age and IQR in all overall patients, severe and non-severe groups.

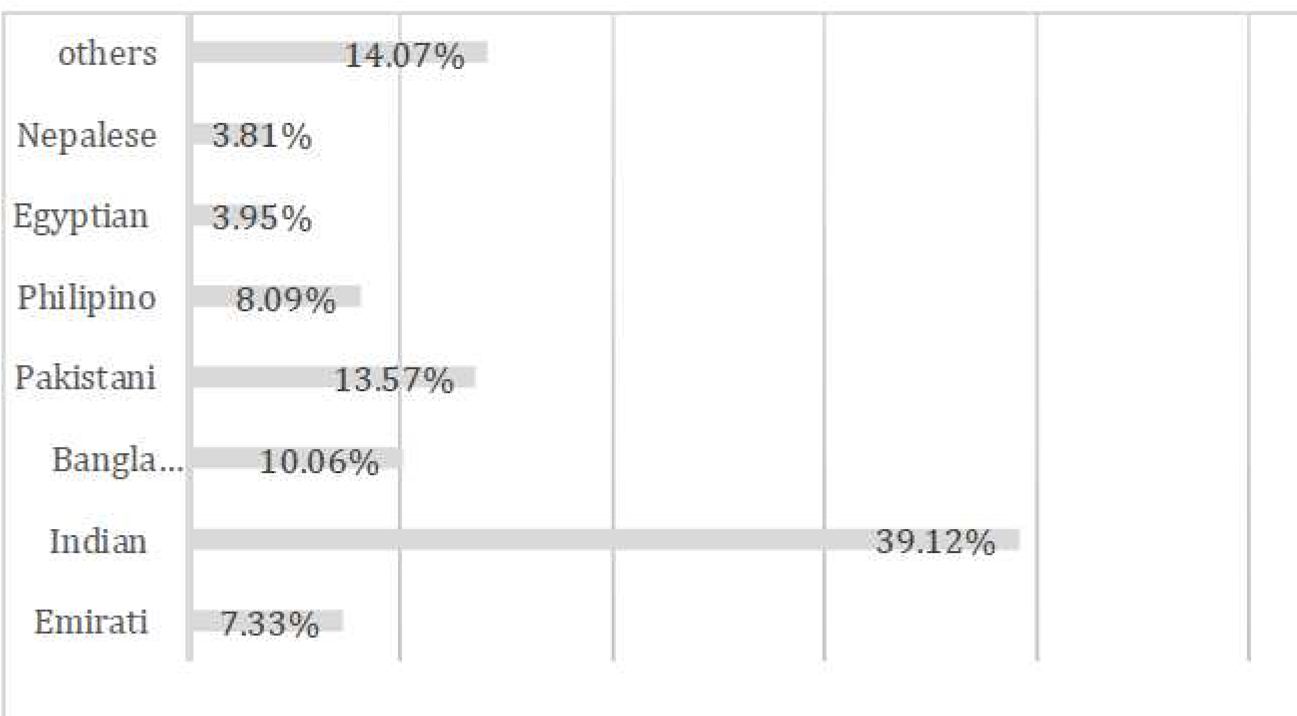


Figure 2

Nationality distribution among severe and non-severe group

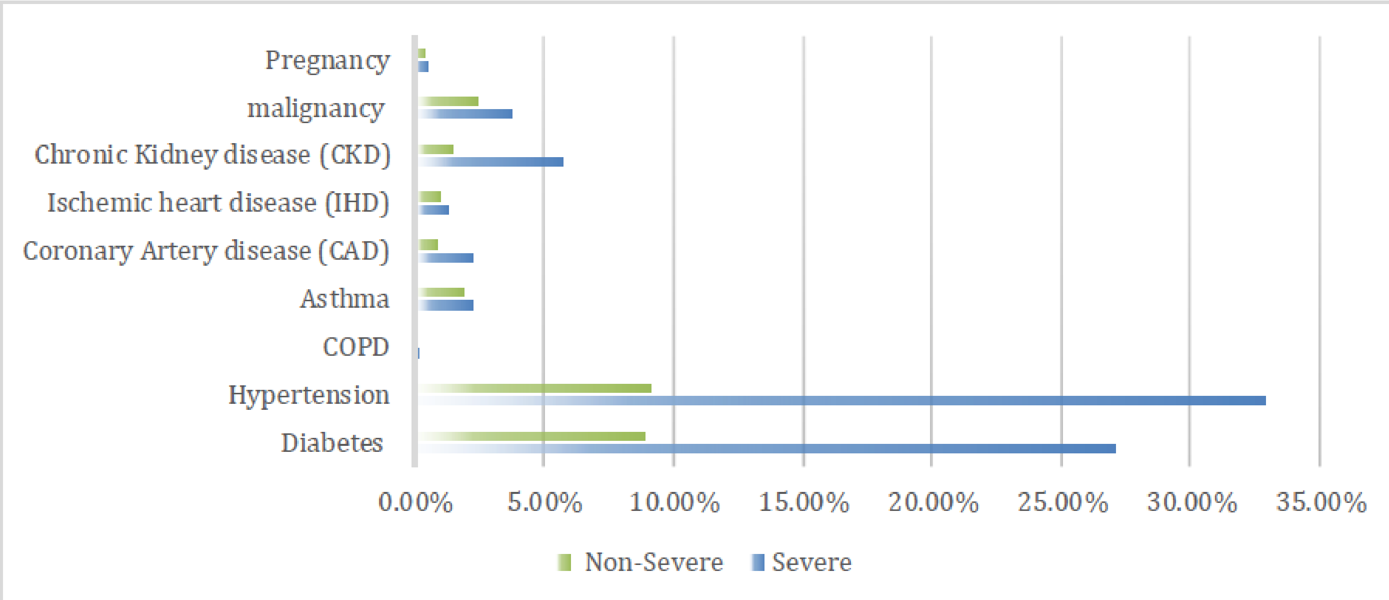


Figure 3

proportion of co-morbidities among severe and non-severe groups

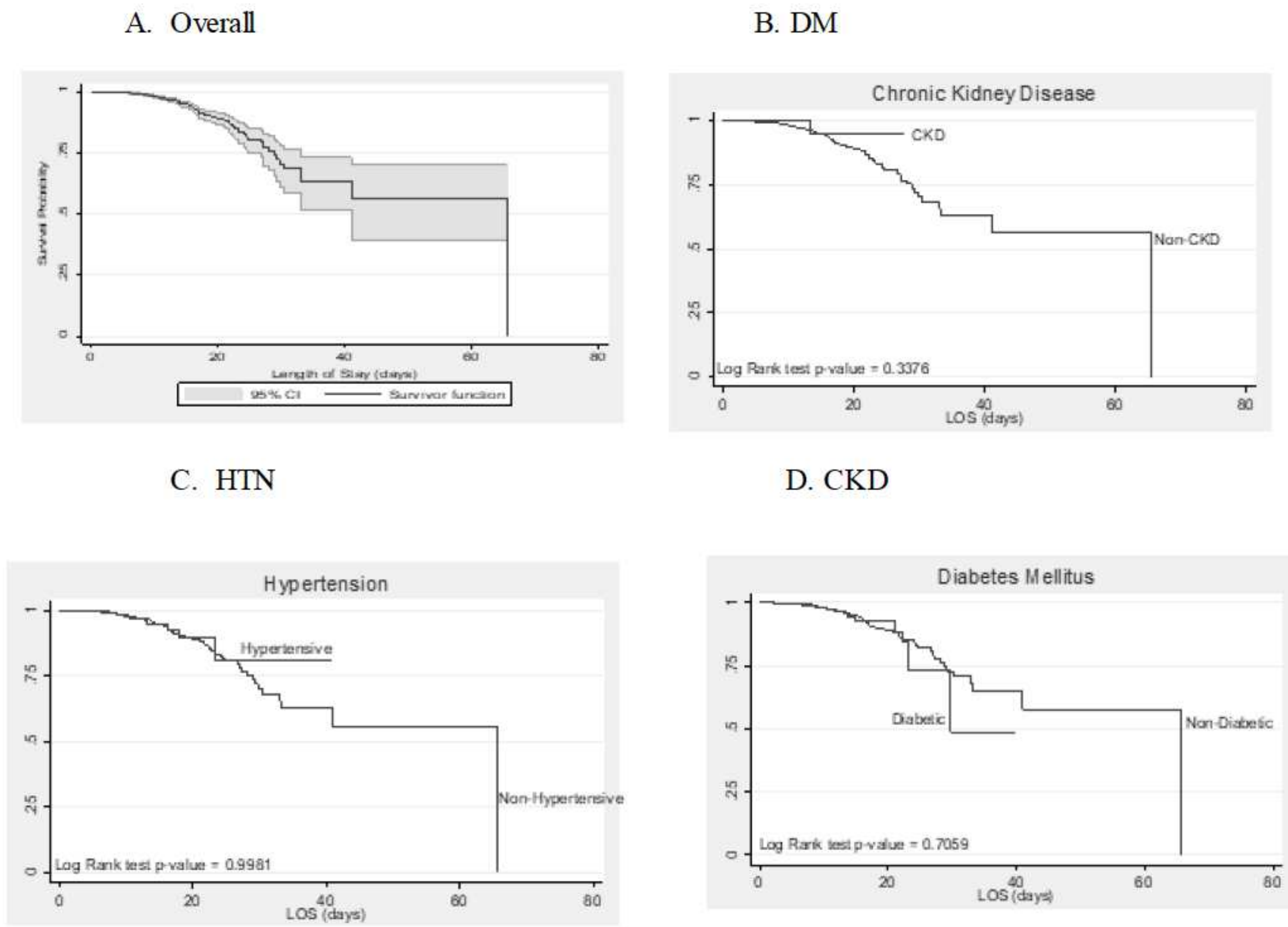


Figure 4

Survival Estimate. Kaplan-Meier survival analysis: A. overall all patients B,C,D. comparison between the three major comorbidities between among all patients.