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Independently associated variables with higher morbidity and mortality: A scientific perspective of a cohort of orthopedic patients with Covid-19

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ABSTRACT

Background & aims: Riyadh, Saudi Arabia latest center for the 2019 pandemic of Coronavirus (COVID-19). The ethnic populations with a higher incidence of obesity tend to be particularly impacted. Our aims were to evaluate the characteristics and early effects on Orthopedic Patients with COVID-19, and to evaluate Orthopedic Patients with poorer outcomes regardless of age, sex and other comorbidities. *Methods:* The first 200 Orthopedic Patients admitted to a tertiary medical center with COVID-19 were included. At least three weeks after admission, electronic patient reports were analyzed. Mortality in hospitals was the main endpoint. *Results*: 200 Orthopedic Patients (female sex: 102) were included. The average BMI was 30 kg / m2. The middle age was 64. The three most prevalent comorbidities were hypertension (76 percent), hyperlipidemia (46.2 percent), and diabetes (39.5 percent). A multi-variate study reveals that BMIs was indigenously correlated with a higher in patient mortality of 35 kg / m2 (reference: BMI 25–34 kg / m2; OR: 3.78; 95 percent CI: 1.45–9.63; p = 0.006; p = 0.061) and age rises (analyzed in quartiles; OR: 1.73; 95 percent CI: 1.13–2.63; p = 0.011). *Conclusions:* This cohort of hospitalized Orthopedic Patients with COVID-19 in the majority minority group is individually related to greater in-hospital mortality and overall poorer in-hospital results with extreme obesity, rising age and male sex.

Keywords: Morbidity and Mortality, Cohort, Orthopedic, Patients, COVID-19.

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1. INTRODUCTION

Coronavirus Disease 2019 (COVID-19), which triggered serious acute coronavirus 2 disease (SARS-CoV-2), has grown into a global pandemic of over two million confirmed cases and nearly 200,000 fatalities so far (World Health Organization, 2019). The first cases in Saudi Arabia were registered in Riyadh on 19 March 2020 (Bhatrajum et al., 2020). Since then, approximately a million verified cases have been registered and sixty thou sand deaths (Centers for Disease Control and Prevention, 2019). The global pandemic epicenter with nearly 160,000 cases reported and more than 12,000 fatalities to date (New York City Department of Health, 2019). Early studies from Asia and Europe described older age, male sex and chronic disorders such as diabetes, asthma, obesity, cardiac failure and coronary artery disease as risk factors correlated with worse results (Zhou et al., 2020). There are, however, few established variables in risk and symptom severity in the US population and in particular in racial groups, who tend to be overwhelmingly influenced by COVID-19 (Grasselli et al., 2020). The age-adjusted mortality rate per 100,000 population is more than double (Yancy, 2020). The higher prevalence among black people with medical disorders deemed risk factors to serious COVID-19 and the higher risk with sensitivity to SARS-CoV-2 related to living and working conditions seem possible causes for the excessive result disparities observed (Yancy, 2020). Riyadh is the most populous area of the Saudi Arabia in 2010. As per the County Health Rankings and Roadmaps (County Health Rankings and Roadmaps, 2019), the Survey ranks among 62 Saudi Arabia Governorates for health results, quality of life and significant health and socio-economic influences. Furthermore, Riyadh has the greatest prevalence of obesity in all cities and is slightly higher than the global average (Montefiore's Office of Community & Population Health Bronx Community Health Dashboard: 2020). In this study our primary goal was to investigate whether obesity among COVID-19 orthopedic patients is linked to bad results in the hospital. Our second goal was to analyze and present the early results of the first 200 orthopedic patients that were diagnosed with COVID-19 and admitted to a broad university center (Centers for Disease Control and Prevention, 2019).

2. MATERIALS AND METHODS

Study design and patient population

This retrospective research was carried out at the King Saud University Medical City, a university in Riyadh KSA. Included are the first 200 orthopedic patients who presented in the emergency department or the intensive care unit (ICU) with COVID-19 verified by laboratory. Orthopedic patients that followed one of the following exclusion conditions were excluded:

i) Home release immediately from ER;

(ii) Referral to our center following receipts of treatment in other institutions; and

(iii) Admission on grounds of non-COVID-19 or non-medical causes.

The 200 involved orthopedic patients were monitored for three weeks after hospital admission (1st-patient admission: 9 March 2020; 200th-patient admission: 22 March 2020; 3-week follow-up completion: 12 April 2020). The research was accepted by the KSUMC Institute Review Board (IRB), (IRB number 2020-11296).

Data extraction

In a predefined data extraction sheet built for this analysis, two researchers (AE, MX) independently analyzed all 200 electronic medical re-cords (EMRs). Discrepancies in debate have been resolved. The index admission documentation was checked by emergency medicine practitioners, staff practitioners, advisors, clinicians, therapists and social staff and laboratory and imaging results. Post-discharge reports were often checked as available (e.g. telemedicine follow-up calls, nursery services). Documentation was often used from previous trips and the EMR search engine. The derived details included demographic baseline information, such as age and gender, race / ethnicity, residency status, health characteristics [BMI], history of smoking, alcoholic drinks, intravenous usage of pharmaceutical drugs, hypertension, diabetes, hyperlipidemia, coronary artery disease, heart failure.(immunosuppressive drugs, ace-inhibitors, angiotensin II receptor blockers), disease-related signs (fever, fatigue, malaise, myalgia, rhinorrhea, respiratory inflammation, sore throat, chest pain, dyspnea, cough, sputum development, nausea / vomiting, diarrhea), appearance indication (oxygen saturation at room temperature, pulse rate, the occurrence of fever), oxygen demand levels. The details is collected and evaluated in a way that maintains patient security in conjunction with the Health Insurance Portability and Transparency Act (HIPAA).

Outcomes and statistical analysis

The Orthopedic Patients were classified into 3 BMI groups: BMI b 25 kg / m2, BMI 25–34 kg / m2, and BMI = 35 kg / m2 according to most re-cent BMI pre- and/or during Index Admission evaluations. Extreme obesity as BMI = 35 kg / m2 was described. Orthopedic

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Patients were often grouped into four age-specific quartiles: CHF 50, CHF 51–64, CHF 65–73 and CHF 74 years. The major endpoint was death in hospitals. Secondary end points included: growing oxygen demand and intubation during hospital stays. The patients who died were removed from the stay study era. Continuous results are provided as median with absolute and relative frequencies inter-quartile range (IQR) and categorical data. In ANOVA, the continuous parameters were compared, while Chi-square was used for discrete parameters. Analyzes of contact were done when appropriate. In order to classify the essential variables of patient death, intubation and growing oxygen needs, a logistical regression was used. As a guide, BMI 25–34 kg / m2 was used to carry out dichotomous associations for Orthopedic Patients for extreme obesity. In order to construct a multivariate model, we have used the following approach for each of the findings studied: Model 1: MOU and era, Model 2: all the variables with substantial univariate correlations (p value as well as 0. 05), and Model 3: model 2 variable, as well as clinically relevant variables with no significant univariate correlation. Additional logistic regression analyzes were conducted using BMI and age as continuous variables. The results of logistic regression are given as the 95 % confidence interval (CI) odds ratio (OR). The statistical meaning criterion was p to 0.05. Both analyzes have been completed with STATA (version 14·1; STATA Company, College Station, TX, United States) program.

3. RESULTS

This study included in total 200 participants admitted to COVID-19 (female sex = 102, BMI b 25 kg / m2 = 38, BMI 25–34 kg / m2 = 116, and BMI = 35 kg / m2 = 46). The average BMI was 30 kg / m2 (IQR 26–35). The bulk of our cases were either Hispanic (34.5%). SNF inhabitants registered for 23.5% of the community. The median age of the whole cohort was 64 (50–73,5) years and the three classes [BMI b 25Kg / m2:73 (64–80) vs BMI 25–34 Kg / m2: 63 [48.5–71] vs BMI os 35 Kg / m2: 57,5 (45–67), p 0,001] were substantially varying. 32.5% of our cohort has become former or retired smokers. 76%, 46.2% and 16.5% of our cases were predominant of asthma, hyperlipidemia and coronary artery disease. 17% have a history of heart disease, and 27.5% had a history of asthma or COPD. A history of persistent kidney failure or ESRD is 29 percent. In 39.5% of our Orthopedic Patients, diabetes was predominant. The comprehensive community and therapeutic baseline characters are illustrated in Table 1.

Table 1 Baseline demographic and clinical characteristics

Characteristic	All patients	BMI group				Age group				
	N = 200	BMI b 25 (N = 38) (a)	BMI 25–34 (N = 116) (b)	BMI ≥ 35 (N = 46) (c)	*p*-Value	≤50 (N = 51) (a)	51–64 (N = 53) (b)	65–73 (N = 46) (c)	≥74 (N = 50) (d)	*p*-Value
Male sex - no. (%)	98 (49.0)	21 (55)	58 (50)	19 (41)	0.420	29 (56.9)	20 (37.7)	29 (63.0)	20 (40.0)	0.027
Age – years Median (IQR)	64(50–73.5)	73 (64–80)[bc]	63 (48.5–71)[a]	57.5(45–67)[a]	0.001	42 (35–46)	58 (56–62)	68(66–70)	78 (75–84)	0.001
Distribution - no. (%) ≤50	51 (25.5)	4 (10.5)[bc]	32 (27.6)[a]	15 (32.6)[a]	0.001	51 (100)	0 (0.0)	0 (0.0)	0 (0.0)	0.001
51–64	53 (26.5)	6 (15.8)[bc]	30 (25.9)[a]	17 (7.0)[a]		0 (0.0)	53 (100)	0 (0.0)	0 (0.0)	
65–73	46 (23.0)	9 (23.7)[bc]	28 (24.1)[a]	9 (19.6)[a]		0 (0.0)	0 (0.0)	46 (100)	0 (0.0)	
≥74	50 (25.0)	19 (50.0)[bc]	26 (22.4)[a]	5 (10.9)[a]		0 (0.0)	0 (0.0)	0 (0.0)	50 (0.0)	
Residence status - no. (%)										
SNF resident	47 (23.5)	13 (34.2)	25 (21.6)	9 (19.6)	0.216	4 (7.8)[d]	11 (20.8)	12 (26.1)	20 (40.0)[a]	0.002
Community-based	153 (76.5)	25 (65.8)	91 (78.5)	37 (80.4)		47 (92.2)[d]	42 (79.2)	34 (73.9)	30 (60.0)[a]	
Race/ethnicity - no. (%) African American	102 (51.0)	21 (55.3)	55 (47.4)	26 (56.5)	0.142	18 (35.3)[bd]	29 (54.7)[a]	22 (47.8)	33 (66.0)[a]	0.004

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Hispanic/Latino	69 (34.5)	8 (21.1)	47 (40.5)	14 (30.4)		39 (56.9)[bd]	15 (28.3)[a]	16 (34.8)	9 (18.0)[a]	
Other BMI-kg/m^2 Median (IQR)	29 (14.5) 30 (26–35)	9 (23.7) 22 (20.7–24)[bc]	14 (12.1) 29 (27–31)[ac]	6 (13.0) 41 (37–46)[ab]	0.001	4 (7.8)[bd] 31 (27–38)[d]	9 (20.0)[a] 32 (29–37)[d]	8 (17.4) 29(25–32)	8 (16.0)[a] 26 (23–30)[ab]	0.001
Smoking - no./total no. (%)										
Never smoked	135 (67.5)	20 (52.6)	80 (69.0)	35 (76.1)	0.064	41 (80.4)	32 (60.4)	26 (56.5)	36 (72.0)	0.044
Former or current smoker	65 (32.5)	18 (47.4)	36 (31.0)	11 (23.9)		10 (19.6)	21 (39.6)	20 (43.5)	14 (28.0)	
Coexisting disorder - no.(%) Any	182 (91.0)	35 (92.1)	106 (91.4)	41 (89.1)	0.872	37 (72.6)[bcd]	51 96.2)[a]	45 (97.8)[a]	49 (98.0)[a]	0.001
Hypertension	152 (76.0)	30 (79.0)	89 (76.7)	33 (71.7)	0.715	25 (49.0)[bcd]	41 (77.4)[a]	40 (87.0)[a]	46 (92.0)[a]	0.001
Diabetes	79 (39.5)	14 (36.8)	41 (35.3)	24 (52.2)	0.133	14 (27.5)	21 (39.6)	24 (52.2)	20 (40.0)	0.102
Hyperlipidemia	92 (46.2)	16 (43.2)	55 (47.4)	21 (45.7)	0.903	15 (29.4)[c]	23 (43.4)	27 (60.0)[a]	27 (50.0)	0.014
Coronary artery disease	33 (16.5)	8 (21.1)	19 (16.4)	6 (13.0)	0.615	3 (5.9)[d]	10 (18.9)	7 (15.2)	13 (26.0)[a]	0.052
Cerebrovascular disease	22 (11.0)	9 (23.7)[bc]	11 (9.5)[a]	2 (4.4)[a]	0.014	1 (2.0)[d]	3 (5.7)[d]	6 (13.0)	12 (24.0)[ab]	0.002
Heart failure	34 (17.0)	14 (36.8)[bc]	12 (10.3)[a]	8 (17.4)[a]	0.001	4 (7.8)[d]	8 (15.1)	7 (15.2)	15 (30.0)[a]	0.026
Asthma	27 (13.5)	5 (13.2)	18 (15.5)	4 (8.7)	0.518	10 (19.6)	4 (7.6)	9 (19.6)	4 (8.0)	0.112
COPD	28 (14.0)	7 (18.4)	14 (12.1)	7 (15.2)	0.597	0 (0.0)[d]	10 (18.9)	7 (15.2)[d]	11 (22.0)[ac]	0.007
Chronic renal disease	58 (29.0)	16 (42.1)	28 (24.1)	14 (30.4)	0.103	7 (13.7)[d]	15 (28.3)	16 (34.8)	20 (40.0)[a]	0.024
CKDIII–V	41 (20.5)	9 (23.7)	20 (17.2)	12 (26.1)		3 (5.88)	9 (16.7)	13 (28.3)	16 (32.0)	0.033
ESRD	17 (8.5)	7 (18.4)	8 (6.9)	2 (4.4)		4 (7.8)	6 (11.3)	3 (6.5)	4 (8.0)	
Active malignancy	11 (5.5)	1 (2.6)	6 (5.2)	4 (8.7)	0.465	0 (0.0)[d]	3 (5.7)	2 (4.4)	6 (12.0)[a]	0.067
Liver cirrhosis	2 (1.0)	0 (0.0)	0 (0.0)[c]	2 (4.4)[b]	0.034	0 (0.0)	1 (1.89)	1 (2.2)	0 (0.0)	0.556
HIV/AIDS	5 (2.5)	1 (2.6)	3 (2.6)	1 (2.2)	0.987	1 (2.0)	3 (5.7)	1 (2.2)	0 (0.0)	0.316
ACEi or ARB use - no.(%)										
ACEi	36 (18.0)	8 (21.1)	20 (17.2)	8 (17.4)	0.862	5 (9.8)	12 (22.6)	9 (19.6)	10 (20.0)	0.347
ARB	25 (12.6)	5 (13.2)	14 (12.1)	6 (13.3)	0.969	5 (9.8)	4 (7.7)	6 (13.0)	10 (20.0)	0.261
None	138 (69.0)	13 (34.2)	34 (29.1)	15 (32.6)	0.821	41 (80.4)	36 (67.9)	31 (67.4)	30 (60.0)	0.167
Immunosuppressive tx - no.(%)	17 (8.5)	3 (7.9)	13 (11.2)	1 (2.2)	0.176	3 (5.9)	5 (9.4)	5 (10.9)	4 (8.0)	0.836

Note: *p*-Values refer to Chi-square test/ANOVA and the letters denote the columns with which a statistically significant pairwise comparison exists (Bonferroni's method). Abbreviations and symbols: BMI=body mass index, IQR=interquartile range, no.= number, SNF=skilled nursing facility, kg=kilogram, m=meter, CKD=chronic kidney disease, ESRD=end-stage renal disease, HIV=humanimmuno deficiency virus, AIDS=acquiredimmuno deficiency syndrome, ACEi=angiotensin-converting enzyme inhibitor, ARB=angio- tensin receptor blocker, tx=treatment.

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The four most frequent signs include fever (86 percent), cough (76.5 percent), dyspnea (68 percent) and malaise (58 percent). The median SO2 on the first day of hospital was 95% (IQR 89–97), with no major community variations. Table 2 presents symptoms and indications. Both 200 Orthopedic Patients obtained X-rays for chest on presentation, 55.5% of whom had bilateral infiltrations and 27% had just one-sided results.

Table 2 Symptoms and signs on presentation

Characteristic	All patients	BMI group				Age group				
	N = 200	BMI b 25 (N = 38) (a)	BMI 25–34 (N = 116) (b)	BMI ≥ 35 (N = 46) (c)	*p*-Value	≤50 (N = 51) (a)	51–64 (N = 53) (b)	65–73 (N = 46) (c)	≥74 (N = 50) (d)	*p*-Value
Symptoms - no. (%) Fever	172(86.0)	29 (76.3)	102 (87.9)	41 (89.1)	0.158	48 (94.1)[d]	47 (88.7)	40 (87.0)	37 (74.0)[a]	0.028
Cough	153 (76.5)	29 (76.3)	88 (75.9)	36 (78.3)	0.948	42 (82.4)	38 (71.7)	37 (80.4)	36 (72.0)	0.456
Dyspnea	136 (68.0)	23 (60.5)	76 (65.5)	37 (80.4)	0.102	37 (72.6)	39 (73.6)	30 (65.2)	30 (60.0)	0.411
Malaise	116 (58.0)	22 (57.9)	70 (60.3)	24 (52.2)	0.637	26 (51.0)	34 (64.2)	29 (63.0)	27 (54.0)	0.446
Diarrhea	66 (33.0)	8 (21.0)[c]	35 (30.2)[c]	23 (50.0)[ab]	0.012	23 (45.1)	21 (39.6)	10 (21.7)	12 (24.0)	0.031
Myalgia	61 (30.5)	9 (23.7)	37 (31.9)	15 (32.6)	0.596	22 (43.1)	17 (32.1)	13 (28.3)	9 (18.0)	0.053
Sputum production	46 (23.0)	8 (21.5)	26 (22.4)	12 (26.1)	0.839	12 (23.5)	15 (28.3)	11 (23.9)	8 (16.0)	0.521
Headache	40 (20.0)	4 (10.53)	26 (22.4)	10 (21.7)	0.267	12 (23.5)	17 (32.1)[d]	9 (19.6)	2 (4.0)[b]	0.004
Nasal congestion or rhinorrhea	37 (18.5)	7 (18.4)	22 (19.0)	8 (17.4)	0.973	14 (27.5)	11 (20.8)	7 (15.2)	5 (10.0)	0.132
Nausea or vomiting	35 (17.5)	4 (10.5)	22 (19.0)	9 (19.6)	0.452	11 (21.6)	10 (18.9)	5 (10.9)	9 (18.0)	0.559
Sore throat	20 (10.0)	4 (10.3)	12 (10.3)	4 (8.7)	0.945	6 (11.8)	7 (13.2)	3 (6.5)	4 (8.0)	0.654
Recorded fever on day 1 - no. (%)	126 (63.0)	22 (57.9)	75 (64.7)	29 (63.0)	0.755	34 (66.7)	34 (64.2)	31 (67.4)	27 (54.0)	0.486
Minimum SO_2 on room air on day 1 Median (IQR) - %	95(89–97)	95(87–97)	95 (93–97)	93 (88–96)	0.346	96(94–97)	94(89.5–97)	94(87–97)	95(88–96)	0.077
Distribution - no. (%)										
≤80%	14 (7.0)	1 (2.6)	8 (6.9)	5 (10.9)	0.003	1 (2.0)	5 (9.4)	6 (13.0)	2 (4.0)	0.407
81–87%	25 (12.5)	10 (26.3)	10 (8.6)	5 (10.9)		4 (7.8)	6 (11.3)	7 (15.2)	8 (16.0)	
88–91%	20 (10.0)	4 (10.5)	6 (5.2)	10 (21.7)		4 (7.84)	6 (11.3)	2 (4.4)	8 (16.0)	
92–96%	86 (43.0)	11 (29.0)	58 (50.0)	17 (37.0)		25 (49.0)	22 (41.5)	18 (39.1)	21 (42.0)	
≥97%	55 (27.5)	12 (31.6)	34 (29.3)	9 (19.6)		17 (33.3)	14 (26.4)	13 (28.3)	11 (22.0)	

Note: *p*-Values refer to Chi-square test/ANOVA and the letters denote the columns with which a statistically significant pairwise comparison exists (Bonferroni's method). Abbreviations: BMI=body mass index, IQR=interquartile range, no. =number, SO_2=oxygen saturation.

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Table 3 Laboratory and imaging findings

Characteristic	All patients	BMI group				Age group				
	N = 200	BMI b 25 (N = 38) (a)	BMI 25–34 (N = 116) (b)	BMI ≥ 35 (N = 46) (c)	*p*-Value	≤50 (N = 51) (a)	51–64 (N = 53) (b)	65–73 (N = 46) (c)	≥74 (N = 50) (d)	*p*-Value
White-cell count Median (IQR) - per $10^3/\mu L$	6.3 (4.7–7.8)	6.3 (4–8.3)	6.1 (4.7–7.6)	6.8 (5.3–8)	0.075	5.7 (4.4–7.5)	6.8 (5.2–8.8)	6.2 (4.7–8.3)	6.3 (5–7.4)	0.622
Distribution										
≥10,000/μL	23 (11.5)	5 (13.2)	13 (11.2)	5 (10.9)	0.937	4 (7.8)	10 (18.9)	5 (10.9)	4 (8.0)	0.249
≤4000/μL	35 (17.5)	10 (26.3)	20 (17.2)	5 (10.9)	0.178	9 (17.7)	8 (15.1)	7 (15.2)	11 (22.0)	0.782
Lymphocyte count Median (IQR) - per $10^3/\mu L$	0.9 (0.7–1.3)	0.8 (0.6–1.1)	0.9 (0.6–1.3)	1.1 (0.8–1.5)	0.467	0.9 (0.8–1.3)	1 (0.7–1.3)	0.9 (0.6–1.4)	0.9 (0.6–1.3)	0.923
≤1000/μL	123 (61.5)	28 (73.7)[c]	73 (62.9)	22 (47.8)[a]	0.047	33 (64.7)	28 (52.8)	30 (65.2)	32 (64.0)	0.512
Hemoglobin - median (IQR) - g/dL	12.7 (11.1–14.2)	12 (10.3–13.8)	13 (11.5–14.3)	13 (10.8–14.1)	0.667	14 (12.1–15.3)[d]	12.7 (11–13.9)	12.9 (11.4–14.1)	12.2 (11–13.1)[a]	0.029
Platelets - median (IQR) - per $10^3/\mu L$	194 (149–240)	178 (134–271)	194 (154–240)	208 (160–231)	0.044	197 (167–231)	200 (151–254)	185 (144–232)	177 (132–240)	0.669
Creatinine - median (IQR) - mg/dL	1 (0.8–1.7)	1.15 (0.8–2.4)	1 (0.8–1.5)	1.1 (0.8–1.7)	0.082	0.9 (0.7–1.2)	0.9 (0.8–1.7)	1.1 (0.8–1.9)	1.2 (0.9–1.8)	0.735
AST ≥ 50 U/L	72 (36.0)	15(39.5)	40 (34.5)	17 (37.0)	0.847	18 (35.3)	23(43.4)	12 (26.1)	19 (38.0)	0.345
ALT ≥ 50 U/L	36 (18.0)	6 (15.8)	22 (19.0)	8 (17.4)	0.900	11 (21.6)	14 (26.4)	6 (13.0)	5 (10.0)	0.116
CK ≥ 200 U/L	104 (52.0)	18 (47.4)	56 (48.3)	30 (65.2)	0.123	21 (41.2)	31 (58.5)	25 (54.4)	27 (54.0)	0.325
Troponin T ≥ 0.1 ng/mL	56 (28.0)	14 (36.8)	32 (27.6)	10 (21.7)	0.305	17 (33.3)	16 (30.2)	10 (21.7)	13 (26.0)	0.606
LDH ≥ 240 U/L	172 (86.0)	33 (86.8)	97 (83.6)	42 (91.3)	0.440	47 (92.2)	46 (86.8)	38 (82.6)	41 (82.0)	0.434
C-reactive protein										
Median (IQR) - mg/dL	8.35(4.4–15)	11.6 (5.5–24.6)	7.75 (4.35–13.9)	9.45 (4.5–14.95)	0.025	8.1 (4.4–14.5)	6.5 (4.4–12.2)	11.2 (4.6–18.8)	8 (3.5–15.6)	0.362
≥5 mg/dL	81/122(66.4)	17/22 (77.3)	48/76 (63.2)	16/24 (66.7)	0.467	23/34 (67.6)	21/33 (63.6)	18/25 (72.0)	19/30 (63.3)	0.893
≥10 mg/dL	55/122(45.1)	12/22 (54.6)	31/76 (40.8)	12/24 (50.0)	0.450	16/34 (47.1)	11/33 (33.3)	14/25 (56.0)	14/30 (46.7)	0.372
≥15 mg/dL	31/122(25.4)	9/22 (40.9)	16/76 (21.1)	6/24 (25.0)	0.169	8/34 (23.5)	6/33 (18.2)	8/33 (32.0)	9/33 (30.0)	0.598
D-dimer ≥ 1 μg/mL	38/64 (59.4)	11/13 (84.6)	19/37 (51.4)	8/14 (57.1)	0.108	9/21 (42.3)	11/16 (68.75)	8/13 (61.6)	10/14 (71.4)	0.281
D-dimer ≥ 3 μg/mL	13/64 (20.3)	2/13 (15.4)	10/37 (27.0)	1/14 (7.1)	0.256	2/21 (9.5)	5/16 (31.3)	2/13 (15.4)	4/14 (28.6)	0.324

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Ferritin ≥ 500 ng/mL	14/22 (63.6)	3/3 (100.0)[c]	10/12 (83.3)[c]	1/7 (14.3)[ab]	0.004	4/5 (80.0)	3/7 (42.9)	6/8 (75.0)	1/2 (50.0)	0.477
Ferritin N 270 ng/mL	20/22 (90.9)	3/3 (100.0)	12/12 (100.0)	5/7 (71.4)	0.095	4/5 (80.0)	6/7 (85.7)	8/8 (100)	2/2 (100)	0.583
Procalcitonin										
Median (IQR) - ng/mL	0.1 (0.1–0.4)	0.1 (0.1–0.8)	0.1 (0.1–0.3)	0.1 (0.1–0.6)	0.544	0.1 (0.1–0.6)	0.1 (0.1–0.6)	0.2 (0.1–0.3)	0.1 (0.1–0.3)	0.346
N0.1 ng/mL	42/98 (42.9)	9/19 (47.4)	23/58 (40.0)	10/21 (47.6)	0.743	6/17 (35.3)	13/33 (39.4)	13/26 (50.0)	10/22 (45.5)	0.762
≥0.25 ng/mL	31/98 (31.6)	6/19 (31.6)	17/58 (29.3)	8/21 (38.1)	0.759	5/17 (29.4)	12/33 (36.4)	7/26 (26.9)	7/22 (31.8)	0.886
≥0.5 ng/mL	24/98 (24.5)	6/19 (31.6)	11/58 (19.0)	7/21 (33.3)	0.307	5/17 (29.4)	9/33 (27.3)	5/26 (19.2)	5/22 (22.7)	0.853
≥1 ng/mL	18/98 (18.4)	4/19 (21.1)	10/58 (17.2)	4/21 (19.1)	0.929	4/17 (23.5)	8/33 (24.2)	1/26 (3.9)	5/22 (22.7)	0.172
Imaging on admission Chest radiography										
No infiltrates	35 (17.5)	6 (15.8)	22 (19.0)	7 (15.2)	0.085	9 (17.7)	10 (18.9)	9 (19.6)	7 (14.0)	0.300
Unilateral infiltrates	54 (27.0)	17 (44.7)	27 (23.3)	10 (21.7)		13 (25.5)	9 (16.9)	12 (26.1)	20 (40.0)	
Bilateral infiltrates	111 (55.5)	15 (39.5)	67 (57.8)	29 (63.0)		29 (56.9)	34 (64.2)	25 (54.4)	23 (46.0)	

Notes: (1) The laboratory values and imaging findings are presented as no./total no.(%) unless specified differently. (2) *p*-Values refer to Chi-square test/ANOVA and the letters denote the columnswithwhich a statistically significant pairwise comparison exists (Bonferroni's method). Abbreviations: BMI= body mass index, IQR=interquartile range, no.=number, g=gram, ng=nanogram, µg=microgram, mg=milligram, L=liter, µL=microliter, dL=deciliter, mL=milliliter, U=unit, AST=aspartate aminotransferase, ALT=alanine aminotransferase, CK=creatinine kinase, LDH=lacticdehydrogenase.

Table 3 describes laboratory and radio-logical observations. In general 24% of our cohort died in the hospital, while citizens with extreme obesity died more often (BMI b 25 kg / m2:31, 6%, BMI 25–34 kg / m2: 17,2%, BMI da 35 kg / m2: 34,8%, p = 0,030). Similarly, it was more probable that people with extreme obesity were intubated (BMI b 25kg / m2: 18.4%, BMI 25–34kg / m2: 16.4%, BMI da 35kg / m2, p = 0.032). In general, 45 per cent of our patients had rising oxygen requirements without major variations between BMI classes when remaining in hospital. ARDS has grown 22% and spent at least one night at ICU 16%. The findings in the hospital are seen in Table 4 and in the Figure 1.

Table 4 In hospital outcomes

Outcomes	All patients	BMI group				Age group				
No./total no. (%)	N =200	BMI b 25 (N = 38) (a)	BMI 25–34 (N=116) (b)	BMI ≥ 35 (N = 46) (c)	*p*-Value	≤50 (N = 51) (a)	51–64 (N =53) (b)	65–73 (N = 46) (c)	≥74 (N = 50) (d)	*p*-Value
Mortality	48(24.0)	12 (31.6)	20 (17.2)[c]	16(34.8)[b]	0.030	6 (11.8)[d]	12 (22.6)	10 (21.7)	20 (40.0)[a]	0.010
Intubation	42(21.0)	7 (18.4)	19 (16.4)[c]	16 (34.8)[b]	0.032	5 (9.8)[c]	12 (22.6)	15 (32.6)[a]	10 (20.0)	0.052
↑ O_2 requirement	90(45.0)	17 (44.7)	46 (39.7)	27 (58.7)	0.090	18 (35.3)	25 (47.2)	22 (47.8)	25 (50.0)	0.441

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ARDS	45(22.5)	6 (15.8)	25 (21.6)	14 (30.4)	0.259	9 (17.7)	10 (18.9)	13 (28.3)	13 (26.0)	0.509
ICU	32(16.0)	3 (7.89)	18 (15.5)	11 (23.9)	0.134	5 (9.8)	11 (20.8)	12 (26.1)[d]	4 (8.0)[c]	0.042
AKI	70(35.0)	13 (34.2)	39 (33.6)	18 (39.4)	0.798	7 (13.7)[d]	19 (35.9)	20 (43.5)	24 (48.0)[a]	0.002
RRT	16(8.0)	1 (2.6)	9 (7.8)	6 (13)	0.216	2 (3.9)	5 (9.6)	5 (10.9)	4 (8.00)	0.606
Length of stay median (IQR)-days	6 (4–10)	6 (4–12)	5 (4–10)	6 (4–9)	0.924	5 (4–7)	7 (5–12)	6 (4–11.5)	6 (4–11)	0.273

Notes: (1) The outcomes are presented as no.(%) unlesss pecified differently. (2) *p*-Values refer to Chi-square test/ANOVA and the letters denote the columns with which a statistically significant pairwise comparison exists (Bonferroni's method). Abbreviations and symbols: BMI=body mass index, IQR=interquartile range, no.=number, O_2=oxygen, ↑=increasing, ARDS=acute respiratory distress syndrome, ICU= intensive care unit, AKI=acute kidney injury, RRT=renal replacement therapy.

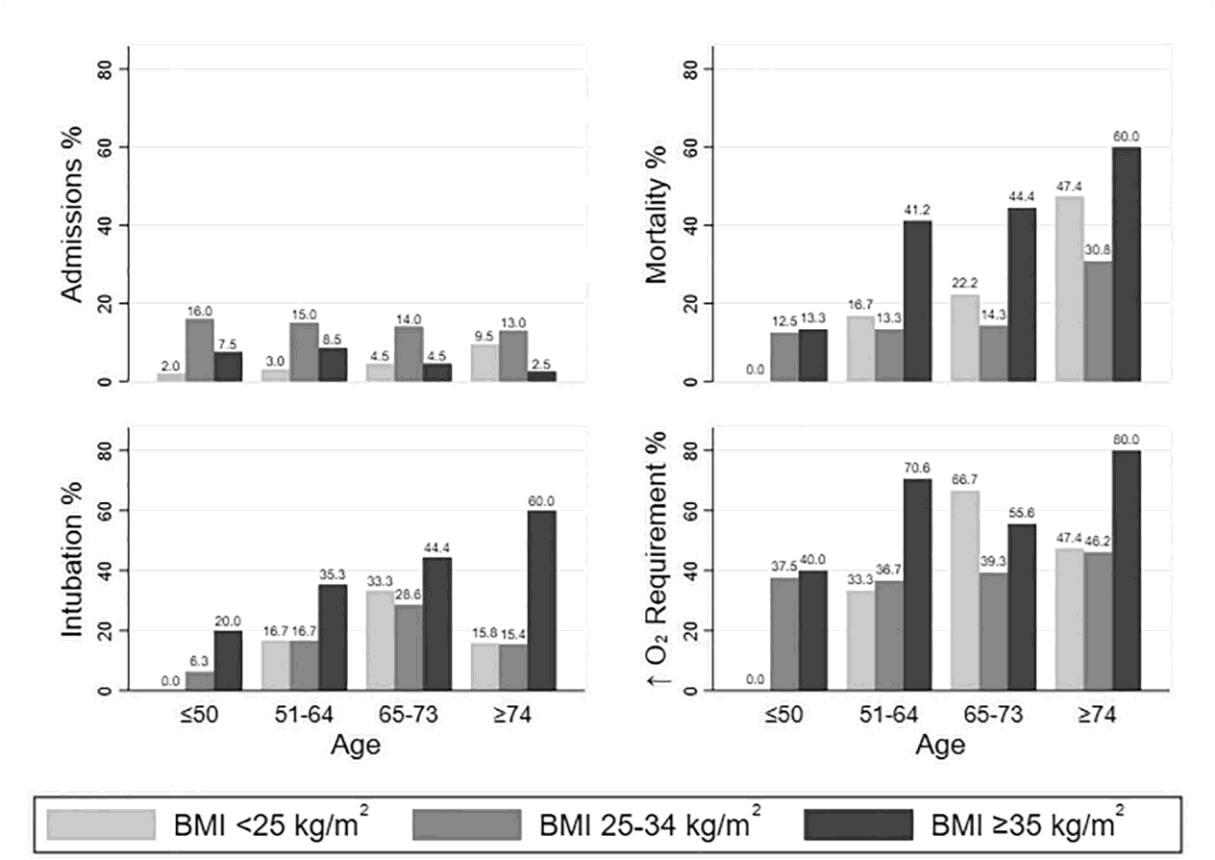

Figure 1 Study population, in-hospital mortality and secondary outcomes per age group (≤50, 51–64, 65–73, and ≥74 years) and body mass index (BMI b25, 25–34, and ≥35 kg/m2).

Logistic regression analyses

In-hospital mortality

Both specific demographic and clinical features were analyzed in the univariate correlations with in-hospital mortality. A strong univariate correlation was observed in age (analyzed in quartiles), male gender, BMI ± 35 kg / m2 (reference: BMI 25–34 kg / m2), cardiac insufficiency, CAD, or CKD and ESRD (Table 5). In univariate correlations, the following factors were not statistically significant: hypertension, hyperlipidemia, obstructive sleep apnea, diabetes and smoking (Table 5). The multivariable anal- ysis

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(Model 3) indicates a strong correlation between the male sex (OR: 2.74; 95% of CI: 1.25–5.98; p = 0.011), a growing age (OR: 1.73; 95% of CI: 1.13–2.63; p = 0.011) and the BMI (OR: 3.78; 95% of CI: 1.45–9.83; p = 0.006).

Table 5 Univariate and multivariate logistic regression analyses for in-hospital mortality

Variable	Univariate	Multivariate		
		(1)	(2)	(3)
	OR, 95% CI, *p*-value	OR, 95% CI, *p*-value	OR, 95% CI, *p*-value	OR, 95% CI, *p*-value
Male sex	2.31(1.18–4.54)*p* =0.015		2.76(1.29–5.93)*p*=0.009	2.74(1.25–5.98)*p*=0.011
Age (quartiles)	1.61(1.19–2.20)*p*=0.002	1.75(1.23–2.49)*p*=0.002	1.74(1.15–2.65)*p*=0.009	1.73(1.13–2.63)*p*=0.011
African American or Hispanic BMI(b25)(25–34)(≥35) BMI(b25)(25–29)(≥30)	0.45(0.20–1.04)*p*=0.062 1.15(0.65–2.02)*p*=0.637 0.79(0.52–1.21)*p*=0.281			
BMI(ref.25–34) b25 ≥35	2.22(0.96–5.13)*p*=0.063 2.56(1.18–5.57)*p*=0.018	1.57(0.68–3.66)*p*=0.294 3.35(1.43–7.87)*p*=0.005	1.31(0.50–3.45)*p*=0.587 3.94(1.56–9.92)*p*=0.004	1.37(0.52–3.64)*p*=0.527 3.78(1.45–9.83)*p*=0.006
Heart failure	3.18(1.46–6.93)*p*=0.004		1.46(0.52–4.13)*p*=0.471	1.43(0.50–4.06)*p*=0.501
Coronary artery disease	2.88(1.31–6.34)*p*=0.008		1.56(0.57–4.30)*p*=0.389	1.53(0.54–4.34)*p*=0.421
Diabetes	1.76(0.91–3.40)*p*=0.091			1.16(0.55–2.44)*p*=0.698
CKD or ESRD	2.14(1.08–4.24)*p*=0.029		1.16(0.50–2.69)*p*=0.723	1.15(0.49–2.68)*p*=0.746
COPD	3.39(1.48–7.80)*p*=0.004		1.85(0.75–4.56)*p*=0.182	2.05(0.76–5.51)*p*=0.156
Residence status (community vs SNF)	0.90(0.42–1.91)*p*=0.779			
Current or former smoker	1.19(0.60–2.36)*p*=0.622			0.83(0.37–1.87)*p*=0.647
Alcohol use	0.61(0.17–2.21)*p*=0.450			
Intravenous drug use	0.44(0.05–3.69)*p*=0.450			
ACEI or ARB use prior to admission	0.78(0.38–1.61)*p*=0.503			
Cerebrovascular disease	0.92(0.32–2.66)*p*=0.883			
Hypertension	0.93(0.44–1.98)*p*=0.853			
Hyperlipidemia	1.09(0.57–2.10)*p*=0.789			
Asthma	0.51(0.17–1.56)*p*=0.238			
Obstructive sleep apnea	2.27(0.76–6.76)*p*=0.141			
Active malignancy	1.88(0.53–6.75)*p*=0.331			
On immunosuppressive therapy	0.66(0.18–2.40)*p*=0.525			
Any disorder	1.11(0.35–3.58)*p*=0.854			
Income (above sample median)	1.56(0.80–3.00)*p*=0.188			

Notes: (1) Multivariate analysis with age (quartiles), BMIb25 and BMI≥35 as regressors, (2) multivariate analysis with addition of all statistically significant variables of the univariate analysis as regressors, (3) multivariate analysis with addition of smoking and diabetes clinical important ones as regressors. Median income was estimated by zipcodes. Age in years. BMI in kg/m^2. For all calculations heteroscedastic adjusted standard errors were used.

Abbreviations: BMI= body mass index, CKD=chronic kidney disease, ESRD=end-stage renal disease, COPD=chronic obstructive pulmonary disease, SNF=skilled nursing facility, ACEi=angiotensin-converting-enzyme inhibitor, ARB=angiotensin II receptor blocker, CI=confidence interval, Ref.=reference.

Increasing oxygen requirements

It appears to have a major standardized correlation between the sex, present or former smoking and the BMI of 35 kg / m2 (reference: 25–34 kg / m2 of BMI) with increasing oxygen consumption (table 6).

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Table 6 Univariate and multivariate logistic regression analyses for increasing oxygen requirements.

Variable	Univariate	Multivariate		
		(1)	(2)	(3)
	OR, 95% CI, *p*-value	OR, 95% CI, *p*-value	OR, 95% CI, *p*-value	OR, 95% CI, *p*-value
Male sex	2.25(1.27–3.98)*p*=0.005		2.71(1.48–4.98)*p*=0.001	2.77(1.48–5.19)*p*=0.001
Age (quartiles)	1.20(0.93–1.54)*p*=0.154	1.28(0.98–1.67)*p*=0.070	1.37(1.03–1.82)*p*=0.033	1.38(1.01–1.89)*p*=0.042
African American or Hispanic BMI (b25) (25–34) (≥35) BMI (b25)(25–29)(≥30)	0.86(0.39–1.89)*p*=0.702 1.37(0.88–2.13)*p*=0.170 1.09(0.76–1.58)*p*=0.628			
BMI (ref.25–34) b25 ≥35	1.23(0.59–2.59)*p*=0.582 2.16(1.08–4.34)*p*=0.030	1.04(0.49–2.20)*p*=0.928 2.37(1.17–4.82)*p*=0.017	0.83(0.38–1.80)*p*=0.635 2.99(1.44–6.21)*p*=0.003	0.95(0.43–2.11)*p*=0.893 3.09(1.43–6.69)*p*=0.004
Heart failure	0.96(0.45–2.02)*p*=0.910			0.56(0.22–1.44)*p*=0.229
Coronary artery disease	1.37(0.65–2.90)*p*=0.413			1.23(0.51–2.94)*p*=0.641
Diabetes	1.46(0.82–2.58)*p*=0.198			1.13(0.60–2.14)*p*=0.710
CKD or ESRD	1.46(0.79–2.71)*p*=0.224			1.00(0.48–2.12)*p*=0.991
COPD	1.77(0.79–3.97)*p*=0.168			1.02(0.40–2.59)*p*=0.964
Residence status (community vs SNF)	1.14(0.59–2.21)*p*=0.701			
Current or former smoker	1.86(1.02–3.39)*p*=0.042		2.10(1.11–3.96)*p*=0.022	2.10(1.07–4.10)*p*=0.031
Alcohol use	2.05(0.76–5.54)*p*=0.157			
Intravenous drug use	1.23(0.30–5.09)*p*=0.773			
ACEI or ARB use prior to admission	0.84(0.46–1.53)*p*=0.560			
Cerebrovascular disease	0.83(0.34–2.04)*p*=0.684			
Hypertension	0.86(0.45–1.64)*p*=0.642			
Hyperlipidemia	1.22(0.69–2.13)*p*=0.496			
Asthma	0.57(0.24–1.34)*p*=0.195			

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Obstructive sleep apnea	1.08(0.37–3.10)*p*=0.893
Active malignancy	1.50(0.44–5.10)*p*=0.516
On immunosuppressive therapy	0.84(0.31–2.32)*p*=0.741
Any disorder	1.32(0.49–3.55)*p*=-0.587
Income (above sample median)	1.00(0.57–1.75)*p*=1.000

Notes: (1) Multivariate analysis with age (quartiles), BMIb 25 and BMI≥ 35 as regressors, (2) multivariate analysis with addition of all statistically significant variables of the univariate analysis as regressors, (3) multivariate analysis with addition of smoking and diabetes clinical important ones as regressors. Median income was estimated by zipcodes. Age in years. BMI in kg/m^2. For all calculations heteroscedastic adjusted standard errors were used. Abbreviations: BMI= body mass index, CKD=chronic kidney disease, ESRD=end-stage renal disease, COPD=chronic obstructive pulmonary disease, SNF=skilled nursing facility, ACEi=angiotensin-converting-enzyme inhibitor, ARB=angiotensin II receptor blocker, CI=confidence interval, Ref.=reference.

Multivariate research (model 3) shows substantial previews in male sex (OR: 2,77; 95 % CI: 1,48–5.19; p=0,001), increasing age of age analyzed in quartiles (OR:1,38; 95% CI:1,01–1,89; p=0,042), BMI (OR: 3,09;95% CI: 1,43–6,69,p = 0,004) and current or preliminary cigarette smoking (OR:2,10; 95 % CI: 1,07–4,10; p = 0,031).

Intubation

It has been identified that male sex and BMI in the 35 kg / m2 (BMI 25–34.9 kg / m2) are substantially univariate in intubation interaction (Table 7). Signifying predictors (Table 7) were observed in multivariable (Model 3), male (OR: 3.35; 95% of the CI: 1.51–7.46, p = 0.002) age rises analyzed in quartiles (OR: 1.50; 95% of the CI: 1.05–2.12; p = 0.025, and BMI = 35 kg / m2 (OR: 3.87, 95% of the CI: 1.47–10.18; p = 0.006)

Table 7 Univariate and multivariate logistic regression analyses for intubation.

Variable	Univariate	Multivariate		
		(1)	(2)	(3)
	OR, 95% CI, *p*-value	OR, 95% CI, *p*-value	OR, 95% CI, *p*-value	OR, 95% CI, *p*-value
Male sex	2.51(1.23–5.14)*p*=0.012		3.39(1.56–7.39)*p*=0.002	3.35(1.51–7.46)*p*=0.003
Age (quartiles)	1.27(0.97–1.68)*p*=0.087	1.45(1.06–1.97)*p*=0.019	1.60(1.15–2.22)*p*=0.005	1.50(1.05–2.12)*p*=0.025
African American or Hispanic BMI(b25)(25–34)(≥35) BMI(b25)(25–29)(≥30)	0.65(0.27–1.60)*p*=0.350 1.72(0.94–3.12)*p*=0.077 0.79(0.52–1.20)*p*=0.281			
BMI(ref.25–34) b25 ≥35	1.15(0.44–3.01)*p*=0.771 2.72(1.24–5.96)*p*=0.012	0.90(0.33–2.44)*p*=0.829 3.19(1.42–7.17)*p*=0.005	0.79(0.28–2.17)*p*=0.643 4.06(1.72–9.57)*p*=0.001	0.76(0.26–2.22)*p*=0.613 3.87(1.47–10.18)*p*=0.006
Heart failure	1.45(0.62–3.41)*p*=0.393			
Coronary artery disease	1.25(0.52–3.03)*p*=0.618			

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Diabetes	1.95(0.98–3.88)*p*=0.058	1.26(0.58–2.73)*p*=0.557
CKD or ESRD	1.30(0.62–2.69)*p*=0.488	
COPD	2.00(0.83–4.82)*p*=0.125	
Residence status (community vs SNF)	1.39(0.59–3.27)*p*=0.446	
Current or former smoker	1.56(0.77–3.15)*p*=0.217	1.66(0.76–3.62)*p*=0.206
Alcohol use	1.51(0.50–4.51)*p*=0.463	
Intravenous drug use	1.27(0.25–6.54)*p*=0.778	
ACEI or ARB use prior to admission	0.64(0.29–1.40)*p*=0.261	
Cerebrovascular disease	0.56(0.16–2.01)*p*=0.376	
Hypertension	0.63(0.30–1.35)*p*=0.239	
Hyperlipidemia	1.98(0.99–3.96)*p*=0.055	1.66(0.78–3.55)*p*=0.188
Asthma	0.62(0.20–1.90)*p*=0.401	
Obstructive sleep apnea	2.76(0.92–8.27)*p*=0.070	1.15(0.40–3.35)*p*=0.791
Active malignancy	1.44(0.36–5.71)*p*=0.602	
On immunosuppressive therapy	0.79(0.22–2.90)*p*=0.724	
Any disorder	0.66(0.22–1.98)*p*=0.463	
Income (above sample median)	1.27(0.64–2.53)*p*=0.489	

Notes: (1) Multivariate analysis with age (quartiles), BMIb25 and BMI≥35 as regressors, (2) multivariate analysis with addition of all statistically significant variables of the univariate analysis as regressors, (3) multivariate analysis with addition of smoking and diabetes clinical important ones as regressors. Median income was estimated by zipcodes. Age in years. BMI in kg/m^2. For all calculations heteroscedastic adjusted standard errors were used. Abbreviations: BMI= body mass index, CKD=chronic kidney disease, ESRD= end-stage renal disease, COPD=chronic obstructive pulmonary disease, SNF=skilled nursing facility, ACEi=angiotensin-converting-enzyme inhibitor, ARB=angiotensin II receptor blocker, CI=confidence interval, Ref.=reference.

Additional analysis with BMI and age as continuous variables

For all three outcomes where BMI and age are processed as continuous variables, we conducted additional logistic regression analyses (Table 8). As a fixed variable, the BMI had minimal responsibility for changes in age and sex (OR: 1.05; CI: 95%: 1.00–1.10; p=0.071) and mortality. However, after correcting for the era, the sex, and all the Covariates inside Model 4, BMI had a significant link with increased demand for oxygenation (OR: 1.05; 95 % CI: 1.01,09; p+0,017) (OR: 1,05; 95 % CI: 1,01–1,10; p=0,014). After age and sex change (Table 8 panel C) BMI has been positively linked to intubation (OR: 1.05; 95 percent CI: 1.01–1.10; p=0.026). The age was substantially correlated in a multi-variant study (model A: 1.03; 95% of CI: 1.00–1.07; p= 0.041) (Table 8 panel A) and with the need to achieve a creaking of oxygen (Table 8 panel A), although trends were noticed (Table 8 panel B) (OR: 1.03; 95% of CI: 1.00–1.05; p=0.071) (Table 8 panel C) in multi-variate analysis (model C). (Model C) Age was considerably associated with mortality (OR: 1.03; 95% of CI: 1.00–1.05).

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Table 8 Univariate and multivariate logistic regression analyses for intubation.

Variable	Univariate	Multivariate			
		(1)	(2)	(3)	(4)
OR, 95% CI, *p*-value		OR, 95% CI, *p*-value	OR, 95% CI, *p*-value	OR, 95% CI, *p*-value	OR, 95% CI, *p*-value
Panel A: In-hospital mortality					
Male sex		3.46(1.63–7.32)*p*=0.001	3.08(1.50–6.36)*p*=0.002	2.86(1.30–6.32)*p*=0.009	2.53(1.19–5.40)*p*=0.016
Age (1.01–1.06) *p* =0.011	1.03	1.05(1.02–1.08)*p*=0.002	1.05(1.02–1.08)*p*=0.004	1.04(1.00–1.08)*p*=0.030	1.03(1.00–1.07)*p*=0.041
BMI≥35 (0.99–4.19) *p* =0.054	2.03	3.77(1.55–9.19)*p*=0.003		3.34(1.34–8.34)*p*=0.010	
BMI (0.96–1.05) *p* =0.753	1.01		1.05(1.00–1.10)*p*=0.071		1.04(0.99–1.09)*p*=0.122
Heart failure				1.57(0.59–4.21)*p*=0.369	1.73(0.66–4.49)*p*=0.262
Coronary artery disease				1.46(0.54–3.96)*p*=0.461	1.32(0.49–3.58)*p*=0.586
Diabetes				1.16(0.56–2.42)*p*=0.683	1.23(0.60–2.54)*p*=0.575
CKD or ESRD				1.25(0.54–2.89)*p*=0.608	1.28(0.57–2.89)*p*=0.551
COPD				1.96(0.73–5.31)*p*=0.183	2.09(0.73–6.01)*p*=0.169
Current or former smoker				0.81(0.36–1.83)*p*=0.620	0.78(0.35–1.73)*p*=0.536
Panel B: Increasing oxygen requirements					

Notes: (1) Multivariate analysis with gender, age and BMI≥35 as repressors, (2) multivariate analysis with gender, age and BMI as repressors, (3) multivariate analysis with the repressors of columns 3 of Tables 5, 6 and 7 for panels A, B and C with (Age and BMI≥35), respectively. (4)Multivariate analysis with the repressors of columns 3 of Tables 5, 6 and 7 for panels A, B and C with (Age and BMI), respectively. Age in years. BMI in kg/m2. For all calculations heteroscedastic adjusted standard errors were used. Abbreviations: OR: odds ratios, CI: confidence interval, BMI: Body metabolic index; CKD: Chronic kidney disease; ESRD: End stage renal disease; COPD: Chronic obstructive pulmonary disease.

Interaction analysis

Because of the strong correlations with the effects that we found for male sex, age and BMI, we established an interaction analysis for this collection of variables. Sex with BMI and age with BMI also tested two separate experiences. Both have not been significant.

4. DISCUSSION

Our research identified the fundamental features, clinical characteristics and early findings of the first 200 COVID-19 hospitalizing patients in a predominantly a community institution. This is the first research which has been performed jointly with adverse effects of age, ethnicity, obesity, and numerous co-morbidities. The key findings can also be summed up as following: (1) in hospital mortality was 24% in the 21-day follow-up, with just 3% hospitalized 2) moderate obesity (BMI ~35 kg / m2), age and male sex

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separately correlated with mortality and intubation 3) extreme obesity (BMI ~35 kg / m2), increasing age, sex and smoking were also independently related to death and need for intubation 3), extreme obesity.

The risk factor for serious disease and death in COVID-19 patients has already been identified as the older age and male sex (Du et al., 2020). Although major result trials are required in order to test this later. The most significant result of this research is that extreme obesity in hospitalized patients with COVID-19 is an important factor in serious respiratory illness and death (Onder et al., 2020). It is worth mentioning that even after modification, this correlation remained important for many clinical entities including asthma, coronary artery disease, cardiac insufficiency, COPD, CKD or ESRD, and smoking, suggesting that obesity can independently predispose harmful outcomes. A J-shaped distribution hypothesis between BMI and death is provided by higher mortality rates in BMIs b 25 kg / m2 and in the BMIs respectively 35 kg / m2 categories. However, this has presumably not been verified in our modified study because of our limited sample of BMI b 25 (old age and vulnerability) coexisting variables (Mo et al., 2020).

Other reported preliminary evidence connects obesity with serious COVID-19 (Richardson et al., 2020). A large New York City cohort has shown that obesity is closely correlated with progression of essential diseases with dramatically higher ratio odds (BMI 30–40 kg / m2 OR: 1.38); 95 % CI: 1.03–1.85; BMI N 40 kg / m2 OR: 1.73; 95% CI: 1.03–2.90) (Petrilli et al., 2020). A cohort from China has found that the potential to experience extreme pneumonia in COVID-19 is dramatically enhanced by obesity (OR: 3.42; 95 percent CI: 1.42–8.27) (Cai et al., 2020). Another China study suggested that obesity is linked to an almost six-fold increased incidence of extreme COVID-19 in patients with metabolically induced liver disease (Zheng et al., 2020). Obesity could partly understand why COVID-19's mortality rate is higher than in China and Japan in countries with a higher prevalence of obesity like Italy (Rebelos et al., 2020). In prior studies from China and Italy (Zhang et al., 2020), a substantial correlation of variables such as diabetes and other cardiovascular and pulmonary comorbidity has been identified. Much were, however, extracted only from univariate calculations. It has been shown in our multivariate analyzes that these co-morbidities undoubtedly arise as they do not vary from the underlying sex, elder age or obesity of men (Dietz, 2020).

Given our past knowledge with pandemic influenza (H1N1) in 2009 outbreak, our results on coupling extreme obesity with mortality in COVID-19 are not unexpected. Morgan and others recorded a substantial correlation of obesity to mortality in adult patients with H1N1 influenza (obesity of OR: 3.1; 95 % CI: 1.5–6.6; morbid obesity of OR: 7.6; 95 % CI: 2.1–27.9) without known pre-existence medical conditions (Morgan et al., 2010). Obesity contributes to enhanced breathing work by increasing the airway resistance and is correlated with diminished volume and functional potential of the expiratory reserve and pulmonary conformance (Falagas and Kompoti, 2006). Central obesity contributes to a lower diaphragm in supine patients that compromise ventilation (de Heredia et al., 2012). In addition, obesity is a persistent inflammatory disorder that is known to influence the immune system and has elevated circulating amounts of pro-inflammatory cytokines, including interleukin-6 (Muscogiuri, 2020). The reported correlation between extreme obesity and mortality could also be at the origin of the correlation between low levels of vitamin D, low in obesity, and mortality which should be further investigated.

On the 21-day follow-up of our cohort, the hospital mortality rate is 24%. In-patient mortality rate (28.2%), 11.7%, and 17%, respectively, is recorded by three Chinese patient cohorts (Fu et al., 2020). A major cross sectional survey from New York City stated that the hospital population had a 14.6% death risk before the review, but the hospital still hospitalizes 35,9% of patients, suggesting that the final hospital-related death rate may potentially be higher. Wide observational cohorts likely to be released in the coming months can specifically quantify the mortality in hospitals. Overall, 33.6% of adults are obese, far more than every other district, while the national incidence of obesity is 20%. In all provinces the Riyadh is the largest in diabetes, and one of the largest hypertension rates (New York State, Department of Health, Division of Chronic Disease Prevention, 2020), the incidence of obesity is higher among citizens with a lower socioeconomic class (N35 percent) and slightly higher. Our organization represents primarily patients of a lower socioeconomic background and individuals who recognize themselves. The mixture of these two accountable for 85.5% of our actual population of science, which reflects the distribution of race and ethnicity (United States Census Bureau, Quick Facts, Bronx County (Bronx Borough), 2020). Our study states that median sales are not a risk factor for worse, based on publicly accessible evidence generated by internal revenue providers. This is clarified by the assumption that Riyadh is a heterogeneous high-income region.

We stated that active or pre smoking during hospitalization was correlated with increasing oxygen requirements. This compares with a recent meta-analysis of five studies in China that find active smoking to a higher likelihood of improvement to extreme COVID-19 (Lippi and Henry, 2019) not statistically correlated with it. The relation of smoking with COVID-19 and other findings can be elucidated by detailed empirical research and possible meta-analysis. One of the benefits of the current trial is that our patients are underserved and socially marginalized minorities. The findings of COVID-19 in these fragile groups are discovered early and are typically under-reported and underrepresented in clinical studies. In comparison, two scholars gathered knowledge

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separately and blindly, eliminating inconsistencies and distortions. There are some shortcomings to our analysis, on the other side. Firstly, our study was relatively limited but given the magnitude of the pandemic, it was of vital importance, particularly given the scarcity of up-to date knowledge in COVID-19 in minorities and under-served communities that our initial data and results were accessible as rapidly as possible. We found that not only high BMI but also BMI b25 among older people was correlated with poorer results in hospitals. We therefore performed interaction analysis among variables which were seen in adjusted analyses (BMI, age, sex) to be correlated with results but no association was found. Given the comparatively limited scale of our sample, broader research must investigate shifts in outcomes and the relationship between these variables. Second, this was a real-world analysis using electronic medical records with a retrospective nature that is suboptimal in contrast to a prospective study that should be further studied. Third, the quickly emerging COVID-19 management might have influenced our findings, but the differential correlation between obesity and mortality is extremely doubtful. Fourth, in the regression study we viewed BMI as a categorical variable with cuts that are largely BMI quartiles. We have, however, also conducted additional analyzes for BMI as a dichotomous (cut-off: 35 kg / m2) or continuous vector.

5. CONCLUSION

In conclusion, we find that extreme obesity has been correlated with increased in hospital mortality even after adapting to other related possibly confounding variables in this sample of hospitalized patients with COVID 19 among the underserved minority prevalent in the community. Particular consideration should be given to avoiding and shielding this population from COVID-19, given the enhanced risk of negative effects once the disease is identified. In addition, the potential higher risk for adverse effects is required for obese patients diagnosed with COVID-19 with special care. Although acknowledging the limitations, we hope that our research would inspire more investigators to examine the impact of obesity in COVID-19 and effects of diagnosed COVID-19 minorities. Wide cohort trials are expected to support our results, and pilot clinical research are important to determine whether obesity and its compounds pharmacotherapy may improve short to long-term outcomes.

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This study has not received any external fund.

Conflict of Interest

The authors declare that there are no conflicts of interests.

Ethical Approval

The research was accepted by the KSUMC Institute Review Board (IRB), (IRB number 2020-11296).

Data and materials availability

All data associated with this study are present in the paper.

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