Covid-19 Severity and Outcome in Patients with Hypertension, Diabetes and Obesity in Erbil City

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Original Article

Summary

Background: Clinical co-morbidity of COVID-19 diseases is the main reason for high severity and mortality outcome. Objective: To assess the relationship between hypertension, diabetes mellitus and obesity with severity and outcome of COVID-19 disease. Methodology: A prospective cross sectional study carried out in West Emergency Hospital in Erbil city-Kurdistan region/Iraq through duration period of six months from 1st of March to 31st of August, 2021on sample of one hundred patients with COVID-19 disease. The hypertension, diabetes mellitus and obesity were assessed by history, clinical examination and laboratory testing. Results: This study showed that 24% of studied hospitalized patients had moderate COVID-19 disease and 76% of them had severe COVID-19 disease. The present study showed a significant association between hypertension and COVID-19 severity with no relationship between both obesity and diabetes mellitus with COVID-19 severity. The common clinical and laboratory markers of hospitalized patients with severe COVID-19 disease are increased respiratory rate, low SPO2, lymphopenia and high C-reactive protein level. Conclusions: Hypertension is the common clinical co-morbidity related to severe COVID-19 disease. The common clinical and laboratory markers of hospitalized patients with severe COVID-19 disease are increased respiratory rate, low SPO2, lymphopenia and high C-reactive protein level. Triage of patients with COVID-19 diseases in emergency department must be based on clinical co-morbidity.

Keywords: COVID-19 disease, Hypertension, Diabetes mellitus, Obesity

1. INTRODUCTION

Since declaration of Corona virus disease 2019 (COVID-19) as a pandemic outbreak by the World Health Organization, this disease rapidly destructed the national health systems of all countries globally (1,2) The first discovery of COVID-19 diseases was in China as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection (3). Severe cases of COVID-19 disease required urgent intervention and deteriorated cases ended in invasive mechanical ventilation or death especially if co-morbid with other medical conditions like hypertension, diabetes mellitus and morbid obesity (4). Risk stratification of COVID-19 disease is essential in prevention and planning for management with priority needs of respiratory care unit (RCU) admission (5).

Many authors from different developed and developing countries all over the world revealed that hospitalized COVID-19 patients with pre-existing chronic medical diseases such as hypertension, diabetes mellitus, obesity, coronary artery disorders, chronic lung diseases, renal diseases and cancer had worsen prognosis and outcome of the disease in addition to severe clinical course as compared to patients free of these chronic medical diseases (6–9). These clinical co-morbidities are regarded as common risk factors of severe COVID-19 diseases and poor outcomes. High prevalence of these co-morbidities globally with pandemic outbreak of COVID-19 disease are leading to exacerbation of outbreak and worsening prognosis (10).

The hypertension, diabetes mellitus and obesity are the predominant chronic medical diseases reported for hospitalized patients with COVID-19 disease with severe clinical course and poor outcomes (6–9). Many literatures identified the impact of hypertension (11,12), diabetes (13,14) and obesity (15,16) on the severity and outcomes of COVID-19 disease. link between hypertension and severe COVID-19 might be related to endothelial dysfunction and renin-angiotensin system dysregulation (17). Highly expressed furin and angiotensin converting enzyme 2 receptor in hyperglycemia status of diabetic patients facilitated entry of SARS-CoV-2 to host cell and the COVID-19 infection with diabetes mellitus lead to immune and inflammatory reactions causing cytokine storm and leading to death (18). The obesity is accompanied initially by respiratory difficulties, metabolic and immunological abnormalities that lead to severe clinical course and poor prognosis of

COVID-19 disease (19). For that, risk of COVID-19 disease severity was increased in patients with combination of these clinical co-morbidities (20).

Although millions of Iraqi peoples were infected with COVID-19 disease with high mortality rates (21), more than half of Iraq-Kurdistan peoples are refusing COVID-19 vaccines (22). To date, frequent COVID-19 cases were hospitalized with severe and poor prognosis (23). The aim of this study was to assess the relationship between hypertension, diabetes mellitus and obesity with severity and outcome of COVID-19 disease.

2. PATIENTS and METHODS

The design of this study was a prospective cross sectional study carried out in West Emergency Hospital in Erbil city-Kurdistan region/Iraq through duration period of six months from 1st of March to 31st of August, 2021. The inclusion criteria were adult (age ≥18 years) patients with COVID-19 disease (positive RT-PCR) and moderate or severe Covid-19 disease according to World Health Organization guidelines 24. Exclusion criteria were younger age patients, negative RT-PCR, mild COVID-19 disease and patients refused to participate. The ethical considerations were included an ethical approval was taken from Kurdistan Board Ethical Committee, oral informed consent of patients and management of patients. A sample of one hundred patients with COVID-19 disease was selected after eligibility to inclusion and exclusion criteria.

The data of enrolled patients were collected by direct interview with patients or from their relatives or saved records in hospital and fulfilled in a prepared questionnaire. The diagnosis of COVID-19 disease was done in regard to National Guidelines by RT-PCR, imaging and laboratory tests. The hypertension, diabetes mellitus and obesity were assessed by history, clinical examination and laboratory testing. Moderate cases were defines by clinical signs of pneumonia with SPO2≥90%, while severe pneumonia by clinical signs of pneumonia (fever, cough, dyspnoea) and one of; respiratory rate > 30 breaths/min; severe respiratory distress; or SpO2 < 90% (24). The patients were followed up from their admission to hospital until their discharge alive or dead. The data collected were analyzed statistically by Statistical Package of Social Sciences software version 22. The chi-square and Fishers exact tests were applied for analyzing categorical variables. Level of

significance (p value) was regarded statistically significant if it was 0.05 or less.

3. RESULTS

A total of one hundred cases of COVID-19 enrolled in the current study. They were 56 males and 44 females. Majority , 76%, had severe disease, shortness of breath reported in (86), non-smokers were (74), loss of taste reported in only 26%, loss of smell in 18%, cough in 62%, dyspnea 74%, myalgia 68%, and only 18% of cases felt being fatigue, (Table 1 and Figure 1).

There was non-significant statistical association between severity of the disease and each of chief complaints and smoking. Pearson Chi square test was done and p–values were more than 0.05. In contrary; a significant statistical relationship between disease severity and gender, males composed 75% mong the moderate cases while 50% of the severe cases. Pearson Chi square test was done and p–value was 0.03, (Table 2).

No significant statistical relationship between severity and signs, symptoms and chronic diseases, (P. value <0.05), except for hypertension where a significant statistical association between disease severity and hypertension was found , (P<0.05). Only a quarter (25%) of the moderate cases were having hypertension, while half (50%) of the severe cases had hypertension. Pearson Chi square test was done and p–value was 0.031, (Table 3).

A statistically significant difference in respiratory rate, pulse oximetry, WBC count, C-reactive protein measures and patient weight between moderate and severe COVID-19 cases. On average, the severe cases had higher respiratory rate and C-reactive protein measures compared to moderate cases, while their pulse oximetry and WBC count were lower than patients with who had moderate condition. t- test was performed to compare between the averages of the two groups and p-values were less than 0.05. In the same manner, severe cases were more obese and heavier (87.83kg) than moderate COVID-19 cases (72.17kg), with p-value of 0.001. In contrast, the difference between moderate and severe cases regarding other numeric measures was not statistically significant, t- test was done and p-values were more than 0.05, these findings are demonstrated in (Table 4)

Table 1. Gender and presenting sign and symptoms of the participants.

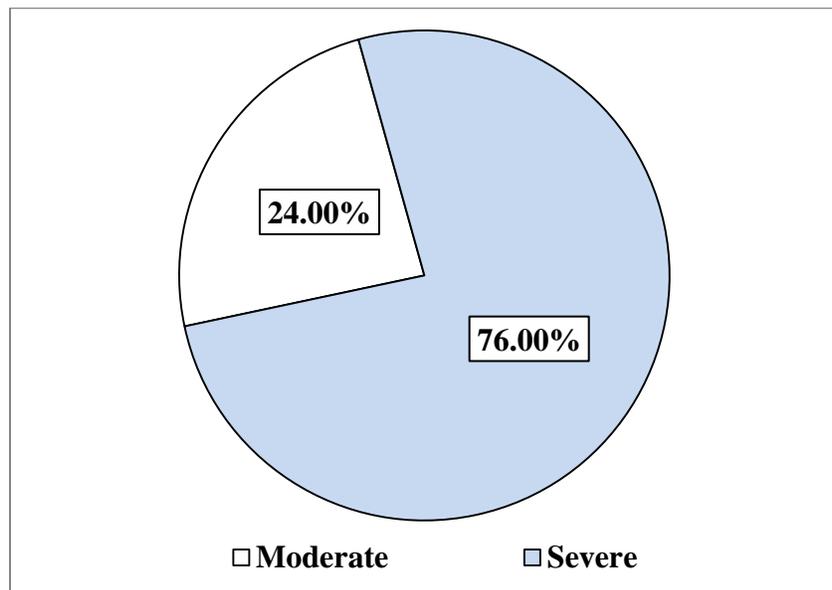| Variables	Categories	Frequency and percent
Gender	Male	56
	Female	44
Complaint at admission	SOB	86
	Cough	4
	SOB and Cough	8
	Fatigability	2
Smoking	Current smoker	6
	Ex-smoker	20
	Non-smoker	74
Loss of taste		26
Loss of smell		18
Cough		62
Dyspnea		74
Myalgia		68
Fatigue		18
Total		100

Figure 1. Severity of admitted COVID-19 cases

Table 2. Association between disease severity and chief complaints, smoking and gender.

Variable	Categories	Severity		p-value
		Moderate	Severe	
Complaint at admission	SOB	24 (100%)	62 (81.6%)	0.207
	Cough	0 (0%)	4 (5.3%)	
	SOB and cough	0 (0%)	8 (10.5%)	
	Fatigability	0 (0%)	2 (2.6%)	
Smoking	Current smoker	2 (8.3%)	4 (5.3%)	0.194
	Ex-smoker	2 (8.3%)	18 (23.6%)	
	Non-smoker	20 (83.4%)	54 (71.1%)	
Gender	Male	18 (75%)	38 (50%)	**0.031**
	Female	6 (25%)	38 (50%)	
Total		24 (100%)	76 (100%)	

Table 3: Association between severity and signs, symptoms and chronic diseases.

Variable	Severity		p-value
	Moderate	**Severe**	
Loss of smell	4 (22.2%)	14 (77.8%)	0.999
Loss of taste	6 (23.1%)	20 (76.9%)	0.898
Cough	12 (19.4%)	50 (80.6%)	0.165
Dyspnea	16 (21.6%)	58 (78.4%)	0.347
Fatigue	2 (11.1%)	16 (88.9%)	0.226
Hypertension	6 (25%)	38 (50%)	**0.031**
Diabetes mellitus	8 (26.7%)	22 (73.3%)	0.683
Coronary artery disease	2 (12.5%)	14 (87.5%)	0.345
Heart failure	2 (33.3%)	4 (66.7%)	0.628
Asthma	2 (20%)	8 (80%)	0.999
Renal failure	0 (0%)	4 (100%)	0.570

Table 4. Difference in qualitative parameters between moderate and severe cases.

Variables	Severity	N	Mean	S.D	p-value
Age (year)	Moderate	24	57.92	16.25	0.093
	Severe	76	64.24	13.27	
BMI (kg/m^2)	Moderate	24	29.8	3.3	0.57
	Severe	76	30.2	2.9	
SBP (mmHg)	Moderate	24	125.42	8.19	0.229
	Severe	76	129.03	16.24	
DBP (mmHg)	Moderate	24	77.50	6.07	0.308
	Severe	76	79.47	8.77	
Pulse rate in bpm	Moderate	24	97.33	20.40	0.306
	Severe	76	93.11	16.56	
Neutrophil count (x10^9/L)	Moderate	24	8.97	3.98	0.957
	Severe	76	8.92	3.80	
Respiratory rate	Moderate	24	17.58	3.45	**0.006**
	Severe	76	25.34	5.62	
Pulse oximetry %	Moderate	24	95.42	2.30	**0.029**
	Severe	76	87.66	5.11	
WBC count (x10^9/L)	Moderate	24	15.05	7.50	**0.043**
	Severe	76	12.23	5.27	
C-reactive protein (mg/L)	Moderate	24	18.00	22.87	**0.001**
	Severe	76	44.65	57.51	

4. DISCUSSION

In current study, 24% of studied hospitalized patients had moderate COVID-19 disease and 76% of them had severe COVID-19 disease. This finding is close to results of Alattef et al (25) study in Iraq and Khamis et al (26) study in Oman which revealed that more than two thirds of hospitalized COVID-19 patients had severe clinical course of the disease. This high proportion of severe cases might be related to long duration of disease until admission and co-morbidity with other medical disorders. Our study showed a significant association between female gender and severe COVID-19 disease. This finding is inconsistent with results of Vhidy et al (27) study in USA which found that hospitalized men had severe clinical course and worse prognosis than women after controlling age. This inconsistency might be due to effects of age and clinical co-morbidity on our study findings. The present study showed a significant association between hypertension and COVID-19 severity. This finding is consistent with results of many national literatures such as Taher et al. (28)study in Iraq and international literatures like Swamy et al. (29) study in USA and Zhang et al. (30) study in China which all documented the direct link between clinical co-morbidity with

hypertension and severe COVID-19 disease. Our study revealed no significant relationship between both diabetes mellitus and obesity with COVID-19 disease. This finding is inconsistent with reports of Holly et al. (31) study in UK which reported a strong relationship between diabetes mellitus and obesity with severity of COVID-19 disease. This inconsistency might be attributed to high prevalence of diabetes and obesity in studied COVID-19 patients that affected statistical relationship and differences in sample size and methodology between different studies. In current study, hospitalized patients with severe COVID-19 disease were characterized clinically by increased respiratory rate, low SPO2, lymphopenia and high C-reactive protein level. These findings are in agreement with results of Chen et al. (32) study in USA and Ghahramani et al. (33) study in Iran which documented that common clinical and laboratory findings indicating severe hospitalized COVID-19 disease were respiratory rate, SPO2, WBC count and C-reactive protein. Nowadays, the appearance of Omicron variant increased the frequency of emergency department visits but not admission of severe COVID-19 cases or death outcome (34).

5. CONCLUSIONS

Hypertension is the common clinical co-morbidity related to severe COVID-19 disease. The common clinical and laboratory markers of hospitalized patients with severe COVID-19 disease are increased respiratory rate, low SPO2, lymphopenia and high C-reactive protein level. Triage of patients with COVID-19 diseases in emergency department must be based on clinical co-morbidity.

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