

The Relationship between the Risk Index of the Body Weight and the Severity of COVID-19 in Middle age Iraqi Patients Under Standard Treatment

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ABSTRACT

Introduction: The novel COVID-19 infection, that is firstly discovered in China as an epidemic, has become a pandemic crisis worldwide resulting in an increase in fatality cases around the world, with economic and social problems. Some reports highlighted increased numbers of hospitalized patients with COVID-19 infection who suffered from the comorbid conditions, particularly those experienced with obesity. Given the possibility of deterioration of the obese patients with COVID-19, this study set out to address the relationship between the bodyweight index and severity of the clinical presentation in patients with COVID-19 infection who treated with a guideline therapy.

Methods: A cross sectional study was performed in which the data for the 41 patients with different bodyweights (infected with COVID-19) were obtained and included patients treated either at home or in hospital based on the score of severity.

Results: This study shows that increased bodyweight is associated with a severe clinical deterioration.

Conclusion: The difference in bodyweight could be a risk factor deteriorating the clinical presentation of patients with COVID-19.

Key words:

COVID-19; obesity; bodyweight index.

Introduction

At the end of 2019, Wuhan, a city in China, exposed to a crisis that is caused by a new coronavirus disease (COVID-19) or also called an acute respiratory distress syndrome (SARS-COV-2)(1,2). This unprecedented epidemic has spread and become a global pandemic disease, with negatively impacts on the population in the entire world in terms of the public health, economy and social life (3). The number of infected individuals has markedly been increasing, with a last updated report on February 2021 by the world health organization (WHO) revealing that figures of the infected cases surpassed 100 million, with increased number of deaths that reached more than 2 million thereby understanding of this disease and knowing the individuals who are highly prone to the severe clinical outcomes are of particular interest (4). There is a growing body of literature highlighting increased number of the in-hospital admission of individuals who experienced with comorbid conditions such as hypertension, diabetes and ischemic heart diseases(3,5). Furthermore, much of the current reports on COVID-19 pandemic pays a particular attention to the correlation between the severity of COVID-19 disease and obesity (6-8).

Literature Review

Indeed, Simonnet *et al.* (2020) demonstrated that the risk of an in-hospital mechanical ventilation of the individuals with a body mass index (BMI) more than 35 kg/m² were seven times greater than that of those with a BMI less than 25 kg/m² (9). Moreover, two metanalysis studies showing similar results in which the subjects with COVID-19, having a high BMI, experienced with a severe clinical presentation compared to those with lower BMI highlighting the critical role of BMI on the severity of COVID-19 (10,11). More recently, literature has emerged that offers contradictory findings about the correlation between the BMI and severity of COVID-19. For example, Cai *et al.* (2020) analyzed the data for 298 patients from a hospital in China (third people's hospital in Shenzhen city) and showed no significant differences in terms of BMI (12). Thus, much uncertainty still exists about the relationship between the BMI and severity of COVID-19 among patients. This study therefore set out to assess the effect of the differences in bodyweight of the patients with COVID-19 on the severity of clinical presentation, particularly those who were exposed to a standard guideline treatment.

Methods

Study design, patients and methods

The study was conducted as a cross-sectional design to observe the influence of the differences in the body weight among patients on the severity of COVID-19 presentation. Patients were exposed to the guideline therapeutic measures.

The sample was collected between July 20 2020 and November 20 2020, and included 41 patients. Data were obtained from different Iraqi hospitals including Medical City; Baghdad, Al-hakeem hospital; AL Najaf and Al-hussein hospital; Karbala. The data were collected by a coordination with the official registry. Some of patients' data obtained in this study were belonged to patients with a mild score (1-3 scores) of the COVID-19 and treated at home under health provider supervision. While the data of others were hospitalized patients with a moderate, to severe and critical scores. All of the enrolled patients were treated according to guidelines for the treatment COVID-19.

All patients enrolled in this study were confirmed as carriers for the COVID-19 by a laboratory-verified COVID-19 of a real time reverse transcriptase polymerase chain reaction (RT-PCR) technique. The specimens were taken from either the nasopharyngeal or oropharyngeal swab. Patients included 30 men and 11 women were between 40-50 years old to mitigate the age bias. Different socioeconomic classes and dietary habits were included.

Patients with severe and relevant medical illnesses were excluded from this study as their illnesses may have masking impacts on the study's outcomes. These conditions include the chronic obstructive airway diseases, myocardial infarction, diabetes mellitus, severe hypertension, thromboembolic diseases, psychiatric illnesses tumors, immunocompromised and alcoholic patients, lactating and pregnant women

The standard treatment was given according to the score of severity and included Clarithromycin/ceftriaxone, dexamethasone, paracetamol and ambroxol. Intravenous fluids and oxygen support were added to list for those with severe and critical scores (13).

The scores of severity were defined as a range from 0 to 10. The parameters included the age, oxygen saturation paO₂, mean arterial pressure, blood urea nitrogen, C-reactive protein, and the international normalized ratio (INR). The grades were considered as low (0–3), moderate (4–6) and high (7–10) (14).

Data Statistical analysis

The mean of the score of severity and the mean of each body weight group were calculated. In order to determine the score versus bodyweight, the relationship was assumed to be linear. The subsequent slope and intersect of trendline were estimated according to $y = ax - b$; where y is the covid-19 score of severity, x is the weight in kilograms, a is the linear slope and b is the y-intersect.

Results

Patients' characteristics

The main clinical features of the 41 patients are illustrated in table (1). The ages were ranged between 40 and 50 years old, with approximately 26 % of whom were female. Around 70 % and 56 % of the participants were from the capital and middle class respectively. In respect to the chronic medical illness, 14 % of whom were experienced with osteoarthritis. Approximately 51 % of the participants were needed to oxygen supply and IV fluids.

Table (1) The estimated data of patients with COVID-19

Covid-19 patients' data	Group 1 (61-70 kg) (N =7)	Group 2 (71-80 kg) (N =6)	Group 3 (81-90 kg) (N =7)	Group 4 (91-100 kg) (N =7)	Group 5 (101-110 kg) (N =7)	Group 6 (110-111 kg) (N =7)
1. Age	43 ± 3 years	45 ±2 years	42 ± 2 years	43 ± 2 years	44 ±3 years	46 ±2 years
2. Sex	F (1), M (6)	F (1) / M (5)	F (2), M (5)	F (2), M (5)	F (1), M (6)	F (2), M (5)
3. Address	Baghdad (5), Najaf (2)	Baghdad (4), Najaf (1), Karbala (1)	Baghdad (5), Najaf (2)	Baghdad (5), Babil (1), Najaf (1)	Baghdad (4), Erbil (2), Najaf (1)	Baghdad (6), Karbala (1)
4. Habits	No smoking, no alcohol	No smoking, no alcohol	Smoker (1), no alcohol	Smokers (2), no alcohol	No smoking, no alcohol	Smokers (2), no alcohol
5. Social class	High (2), middle (5)	Middle (6)	High (2), middle (5)	High (2), middle (4), lower (1)	High (3), middle (4)	High (1), middle (5), lower (1)
6. Chronic medical illnesses	None	OA (1), none (5)	Hypersensitive airway (1), None (6)	Overweight (1), none (6)	OA (2), overweight (1), none (4)	OA (3), overweight (4)
7. COVID-19 treatment	azithromycin, dexamethasone, paracetamol	azithromycin, dexamethasone, paracetamol	azithromycin, dexamethasone, paracetamol	azithromycin, dexamethasone, Paracetamol, IV fluids, O ₂	azithromycin, dexamethasone, Paracetamol, IV fluids, O ₂	azithromycin, dexamethasone, Paracetamol, IV fluids, O ₂

Abbreviations: OA, osteoarthritis; F, female; M, N, number, O₂, oxygen; IV, intravenous.

The COVID-19 severity score versus patient's body weight in kilograms

The present study shows that bodyweight is represented as a risk factor in deteriorating the patients with COVID-19. The graph shows that there has been a marked increase in the number scores in patients' group with whom a bodyweight ranging from 111-120 kgs. In contrast, patients having a bodyweight less than 70 kgs were scored as mild **Figure 1**.

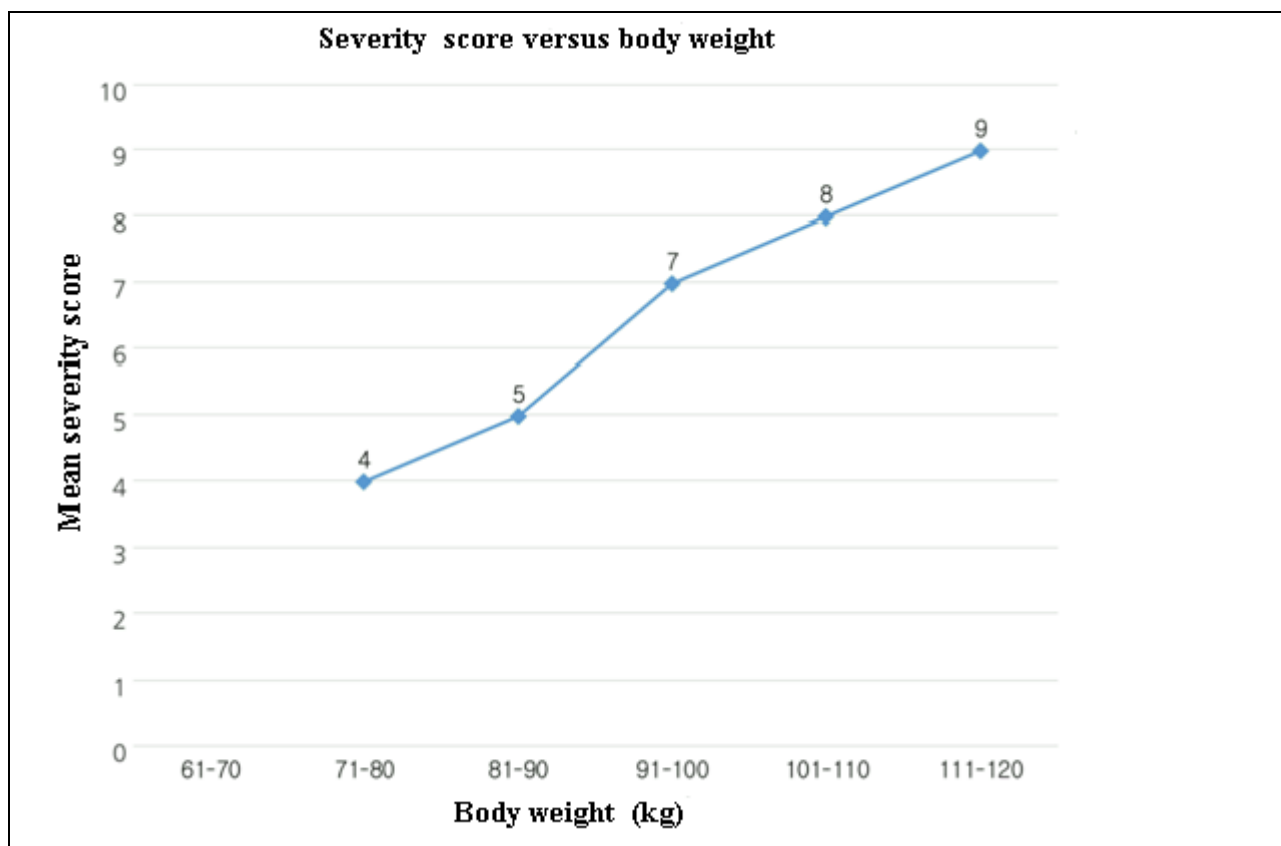


Figure 1: The polygon indicates the relationship between patients' mean body weight and the score of severity of COVID-19 presentation. On applying the linear function $y = ax - b$ the graph will obtain a score equal to 0.1 and body weight equal to - 2.6. The slope revealed a positive value, that means, patient's body weight is a risk factor in the prognosis of COVID-19 by the factor of 1.1-fold more than control.

Discussion

The human bodyweight may contribute as a protective or a risk factor and influence the prognosis of many diseases. Pulmonary function is proportionally deteriorated with the increased bodyweight due to the increase in O_2 demand and diminished air-blood partition of the exchange (15). It is well-known that health effects of the obesity are associated with a cardiovascular load, decreased immunity and disturbance of the endogenous hormones. These factors may play a role in severity and complications, particularly in patients with COVID-19 compared with patients with COVID-19 having normal bodyweights (16,17).

The most obvious finding to emerge from the analysis is that a marked increase was found in the risk factor (1.1 X) in comparison with the basal line. Furthermore, patients with bodyweights

below 90 kg were associated with a mild to moderate clinical presentation of the COVID-19. These results match those observed in earlier studies in which they found that patients with increased bodyweights were at risk of the severe COVID-19 infection (18,19). This correlation is not only found with COVID-19 disease but also with other respiratory viruses such as H1N1 influenza virus infection (20). Although the potential mechanisms behind this relationship are not well understood, they may partly be explained by an abundant angiotensin converting enzyme 2 (ACE2) expression in adipose tissues compared with other tissues or organs such as the lung and heart (21). ACE2 is considered a potential target for COVID-19, playing a role in entering the COVID-19 virus into the host cells by a mechanism associated with a renin angiotensin pathway (22). Therefore, higher expression levels of the ACE2 found in patients with high adipose tissues can be responsible for the deterioration of COVID-19 infection (23). Another possible explanation for this is that the complement system has been found to be a critical player in COVID-19 induced infection by acting as a mediator of this virus thereby inducing an excessive inflammatory response (24). Increased activity of the complement system is associated with obese patients, this may interpret the severity of the COVID-19 that may be due to potential overstimulated immune responses (25,26). Although the current study is based on a small sample of participants, the findings suggest that patients with high bodyweights may be at a high risk of the severe clinical presentation and it is important to those group of patients to get a particular attention, attempting to reduce the risk of COVID-19 consequences. Thus, further research needs to examine more closely the links between the bodyweight index and severity of the COVID-19 infection.

Conclusion

The results of this study indicate that bodyweight index may play a role in the deterioration of patients with COVID-19 infection. Therefore, further studies regarding the potential role of bodyweight in the severity of COVID-19 infection would be worthwhile.

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