

OBESITY AND COVID 19-TWO INTERCONNECTED PANDEMICS

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Abstract:

Corona virus disease commonly known as COVID-19 is a severe pandemic that has spread globally causing large number of deaths till date. Obesity is a disease caused due to excessive fat accumulation in the body. High calorie diet intake and lack of physical activity has increased obesity at an alarming rate causing it to reach pandemic proportions worldwide. An interrelationship exists between these diseases. On one hand, obesity has emerged as an important risk factor of disease severity in COVID-19 while on the other hand, worldwide spread of COVID-19 and increased treatment requirements have resulted in less attention to other non-communicable diseases including obesity. This study reviews both the role of obesity as a risk factor of COVID-19 and the negative impact of COVID-19 pandemic on obesity incidence and care. The study analyses the effect of obesity on COVID-19 complications including recovery time, ICU admission, IMV requirement, poor outcomes and death. The review also takes into account the role of obesity on COVID-19 vaccine efficacy.

Keywords: COVID-19, Obesity, Risk factor, pandemic

Introduction:

Corona virus disease (COVID-19) was declared as a pandemic by WHO on March 12 2020^[1]. Risk factors linked to the disease include age, crowding, use of certain medications, pregnancy and underlying medical conditions including cardiovascular diseases, cancer, Type II diabetes mellitus and hypertension^[2].

Obesity is a disorder caused due to increased amount of fat in the body. A person is considered to be obese when body mass index is greater than 30kg/m²^[3]. In 1997 WHO declared obesity as a major health issue and global epidemic^[4]. Unhealthy eating habits (high calorie diet) and sedentary lifestyle (lack of physical activity) has caused obesity to reach pandemic proportions worldwide^[5].

Obesity has now emerged as important risk factors for disease severity in COVID-19^[6]. Recent studies have linked obesity to severe corona virus disease and death. The study aims to review the interrelationship between COVID-19 and obesity. The study tends to analyze the effect of obesity on

COVID-19 complications including recovery time, ICU admission, IMV requirement, poor outcomes and death and the effect of obesity on COVID vaccine efficacy.

RISK FACTORS OF COVID -19 DISEASE

Although COVID 19 can equally affect people in all age groups, certain potential risk factors linked to the disease include^[2,7]:

- Age
- Certain occupation
- Ethnicity/race
- Alcohol
- Smoking
- Physical inactivity
- Pollution
- Obesity

It is also associated with underlying diseases such as^[2, 8].

- Diabetes

- Cardiovascular diseases
- Cancer
- Asthma
- COPD
- Down Syndrome
- Chronic Kidney disease
- Sickle Cell Disease
- Obesity

World Health Organization describes obesity as an important NCD risk factor of COVID-19 disease.

OBESITY- A RISK FACTOR OF COVID 19 INFECTION AND COMPLICATIONS

Obesity is a disorder caused due to excessive fat accumulation in the body. In terms of Body Mass Index, BMI greater than 30kg/m^2 is considered as obesity^[3].

Obesity is a risk factor of diseases such as:

- Diabetes - diabetic complications were found to be higher in obese patients^[9].
- Influenza A (H1N1)^[10].

Numbers of studies portray obesity as a risk factor of severe COVID 19 disease. This may be due to a variety of reasons:

- Obese people tend to have a greater number of adipocytes in their body. Adipose tissue is rich in ACE2 (Angiotensin Converting Enzyme 2) receptor which is a target site for entry of corona virus to human body^[11, 12]. This leads to higher viral loads and increased viremia.
- Obesity also alters the immune function of the host. Increased level of inflammatory cytokines and decreased adiponectin levels in obesity reduce immunological response to infection. B and T cell functions are impaired causing delay in resolution of viral infections^[13, 14].
- Increased visceral fat causes an outflow of pro inflammatory cytokines contributing to a condition called cytokine storm^[13, 15]. Obesity is also associated with thromboembolic complications and decreased pulmonary function which leads to higher complications in corona virus disease^[16].
- Obesity is related to various co morbidities like hypertension, type 2 DM, cardiovascular and renal

diseases increasing the severity of disease in covid patients^[17].

OBESITY AND COVID-19 RECOVERY TIME

- Recovery time refers to the time taken for the disease symptoms to subside and the patient to become completely free from COVID 19 infection. Recovery time has a strong influence on the disease severity and economic burden caused due to the disease^[18, 19]. Obesity has found to prolong recovery time in covid patients.
- A study conducted in Israel showed that obese covid patients were admitted in hospital for a longer duration than non-obese covid patients (20.6 vs 16.0 days)^[20] which ultimately mean that viral load was higher in obese thus increasing severity of COVID 19 infection.
- Similarly, a cohort study conducted in a group of 75 patients in Wenzhou in China showed obese COVID-19 patients had significantly longer hospital stay (23Vs 18 days) and severe complications than non-obese patients^[21].
- Another study conducted in Italy also reported similar results(21Vs 13 days)^[22].

OBESITY AND ICU ADMISSION IN COVID -19

- When body mass index of COVID patients was correlated with ICU admission, patients having BMI higher than 35 kg/m^2 were critically ill as compared to those with normal BMI^[23, 24, 25].
- In patients below 60 years, obese adults were twice more likely for ICU treatment as compared to non-obese adults^[26].
- A strong link exists between obesity, ICU admission and mortality in COVID -19 patients^[16,26,27]. This may be due to the chronic diseases present as co morbidities in obese patients.

OBESITY AND IMV NEED IN COVID 19

- IMV (Invasive Mechanical Ventilation) is usually the last option and opted only when the patient has reached the last stage of the disease. IMV need was found to be higher in obese with COVID- 19 patients^[16,28]
- A study conducted in 393 covid patients in New York city showed that those receiving IMV had higher rate of obesity than those who did not need IMV^[27].

• Similarly a study conducted in France also showed that IMV requirement significantly correlated with BMI and those with BMI higher than 35 kg/m² were at a seven fold increased risk of IMV.^[16] The above studies highlight the fact that IMV need in COVID-19 is increased in obesity.

OBESITY AND COVID-19 DEATH

- Obesity has found to cause high death rate in hospitalized COVID-19 patients.
- A study conducted in Milan, Italy showed that hospitalized patients who died due to COVID-19 had high rate of obesity than ones who survived^[29].
- Similarly, a retrospective study conducted in young COVID-19 patients in China revealed that obesity was a critical factor contributing to death in young population^[30].
- Obesity has become common in individuals below 50 years of age related to risk factors including hypertension, cardiovascular diseases and type 2 DM thus shifting risk of COVID-19 death to younger populations^[31].

OBESITY AND POOR COVID-19 OUTCOMES

- Obesity is associated with severity outcomes of COVID-19^[32, 33].
- BMI of patients with COVID-19 pneumonia was found to be greater than those without pneumonia^[34].
- Similarly, the incidence of ARDS was higher in obese patient group as compared to non-obese group^[35].
- A study conducted by Klang et al stated that obesity is a risk factor of COVID-19 progression independent of cardiovascular disease and diabetes^[36].

OBESITY AND COVID VACCINE EFFICACY

- Latest reports suggest that COVID vaccine may not be fully effective in people suffering from obesity^[37].
- As mentioned above a number of studies reveal that disease severity is potentially high in obese covid-19 patients.
- This is because of the fact that immune response and process of healing may be slower in an obese individual. This applies to immune system response to COVID 19 vaccine as well.
- A study published in 2017 September to evaluate the effect of obesity on risk of influenza and

influenza-like illness among those vaccinated showed that the flu vaccine is only half as effective in people with obesity compared to non-obese people^[38]. Now studies are being conducted to determine whether such an association exists between obesity and COVID-19 vaccine efficacy.

- Media reports suggest that a 'new study has revealed Pfizer vaccine for COVID-19 might be less effective in obese people'. The study carried out by Italian researchers suggested that obese health care workers who received the COVID-19 vaccine were not able to produce as many antibodies as their healthy peers^[39].
- However, this new study has not been yet been peer reviewed and only provide first direct evidence to suggest that a problem similar to influenza vaccine may also exist with COVID-19 vaccines.
- Even though more studies are required to confirm the relation between obesity and COVID vaccine efficacy, this study provides important implications for developing strategies of COVID vaccine in obese population.

EFFECT OF COVID-19 ON OBESITY

- On one hand emerging data reveal that there is a strong relationship between obesity and COVID-19 complications while on the other hand, global spread of COVID-19 disease and increased treatment requirements have resulted in less attention to other non-communicable diseases including obesity^[40].
- For example, The European Association for the study of Obesity (EASO) conducted an electronic survey in the EASO Collaborating Centers for Obesity Management (COMS) in Europe to know the efficacy of obesity care during COVID-19. Responses received revealed that covid -19 has affected obesity care in Europe negatively. Medical and surgical treatment for obesity were either reduced or cancelled^[40].
- In addition, COVID-19 lockdown and need for self-isolation had caused physical inactivity and unhealthy eating habits in many thus contributing to obesity^[41].

Conclusion

COVID-19 causes severe complications especially in patients with co morbidities including cardiovascular diseases, hypertension, type2 DM and obesity.

Obesity has emerged as a risk factor contributing to disease severity in COVID-19 increasing recovery time, IMV requirement, Admission in ICU and death rate in COVID-19 patients. Obesity was also found to affect COVID vaccine efficacy.

Emergency caused due to COVID 19 pandemic was found to divert attention from care of non-communicable diseases including obesity. Lockdown due to COVID-19 led to unhealthy eating habits and physical inactivity thus contributing to obesity. Hence it is important to consider obesity as a serious risk factor determining disease severity in COVID - 19 and take necessary measures to guide treatment options in obese COVID-19 patients.

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