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REVIEW ARTICLE

# Challenges Faced by Acutely Ill COVID 19 Patients with Obesity: A Narrative Review

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ABSTRACT

Several studies have shown that people with obesity are more likely to experience worse outcomes with COVID 19 infection, regardless of the severity of illness and the presence of other comorbidities. The same population also experiences numerous disparities while accessing health care. From obesity related stigma embedded in thought processes of healthcare personnels to lack of widespread availability of equipment/personnel to handle patients with obesity delay appropriate care reception. As described in this article, these systemic disparities become more evident amongst critically ill COVID 19 patients by directly contributing to severe morbidity and mortality. The pandemic highlighted the unmet need amongst this population in reception of acute and subacute medical care. Also, it shed light on the opportunities to improve the status quo in healthcare delivery. Therefore, it is of utmost importance that the health care system works toward eliminating systemic biases associated with acute care for patients with obesity. As the proportion of obese population is continually growing in the United States without the necessary reformation in the health care system, this article is intended to inform policy makers of the urgent need for reformation of the acute and subacute health care systems in order to accommodate the changing needs of the population.

## Introduction

According to the National Health and Nutrition Examination Survey (2017 - 2020), around 42% of the US population are living with obesity (defined as BMI >30), out of which 9.2% are living with morbid obesity (defined as BMI> 40)[1]. Several studies have shown that individuals with obesity are more likely to experience worse outcomes with COVID 19 infection, regardless of the severity of illness and the presence of other comorbidities. Multiple attempts have been made to provide scientific explanations for what causes poor health outcomes among obese patients infected with COVID 19. This includes characterization of obesity as a proinflammatory, prothrombotic and an immunocompromised state[2]. However, there is a paucity of literature to adequately explain the impacts of social determinants of health on patients with obesity and acute COVID 19 related illnesses. Access to healthcare services is one of the social determinants that adversely affect the health of this population especially when they are acutely sick. The purpose of this article is to summarize the barriers to prompt reception of acute care for obese patients with COVID-19 infection, elucidate the gap in data that if fulfilled is likely to improve the health of the same population. Also, the need for policy level changes to promote optimal resource allocation to cater to the needs of this special population is highlighted. The results of this article are significant in promoting health equity for populations with obesity.

## Methods

The search was conducted in Pubmed using keywords like 'obesity', 'obese', 'critical illness', 'barriers to healthcare access', 'acute COVID 19 illnesses. Prospective studies, meta-analysis, commentaries and systematic reviews published until July 2023 were sorted through. Inclusion criteria was checked by both authors before adopting the primary findings of the studies into this review. The references of the articles were searched for any relevant materials.

## Significance of SARSCoV2 infection in obese patients

Several studies have shown a J-shaped association between mortality from COVID 19 pneumonia and weight, which means that patients at extremes of weight are known to succumb to complications more than those with normal weight[3]. An empirical analysis of association between prevalence of obesity and COVID 19 mortality amongst 142 countries shows that countries with higher prevalence of obesity have higher mortality rate from COVID -19[4]. A review by Gomer et al. 2021 describes obesity, COVID 19 infection and hypercoagulability as a lethal triad[2]. A meta-analysis of 167 studies by Singh et al in 2022 shows that individuals with obesity are 1.5 times more likely to experience adverse outcomes when compared to individuals without obesity[5]. Multiple other studies have found linear relationships between increasing BMI and outcomes like higher need for hospitalization, ICU admission, longer length of stay, risk for falls, pressure related injuries and higher risk for readmissions to acute care facilities[6,7]. The association holds good after adjusting for age and other comorbidities[23] and becomes more evident when taking into account socio-economic status, income and education level of the population with obesity[8]. Therefore, it is evident that populations with obesity were differentially affected than populations with normal weight.

## Intersection of the COVID 19 pandemic with the pandemic of obesity

Over the last 5 decades, the prevalence of obesity has persistently increased in the United States despite increasing recognition of complications associated with obesity[9,10]. At present, Obesity is well recognized as a chronic condition. It is well known to negatively impact the immune mechanisms of the host and thus, it increases the risk of acquiring infections like COVID 19[11]. Once acquired, risk of progression to severe illness is higher among this population due to a combination of physiological and sociological factors. Physiological factors include compromised respiratory reserve, underlying hypercoagulability, coexistence of multiple other comorbidities and ongoing adiposity related chronic inflammation[12]. As evidenced in a study utilizing a sample of adults from the 2006-2015 National Health Interview Survey, sociological factors including underutilization of preventive care services, prior negative experiences in reception of acute care negatively impacted the health of this population independent of underlying major mental health problems and chronic health conditions[13]. These factors act synergistically to exacerbate the health disparities experienced by obese individuals.

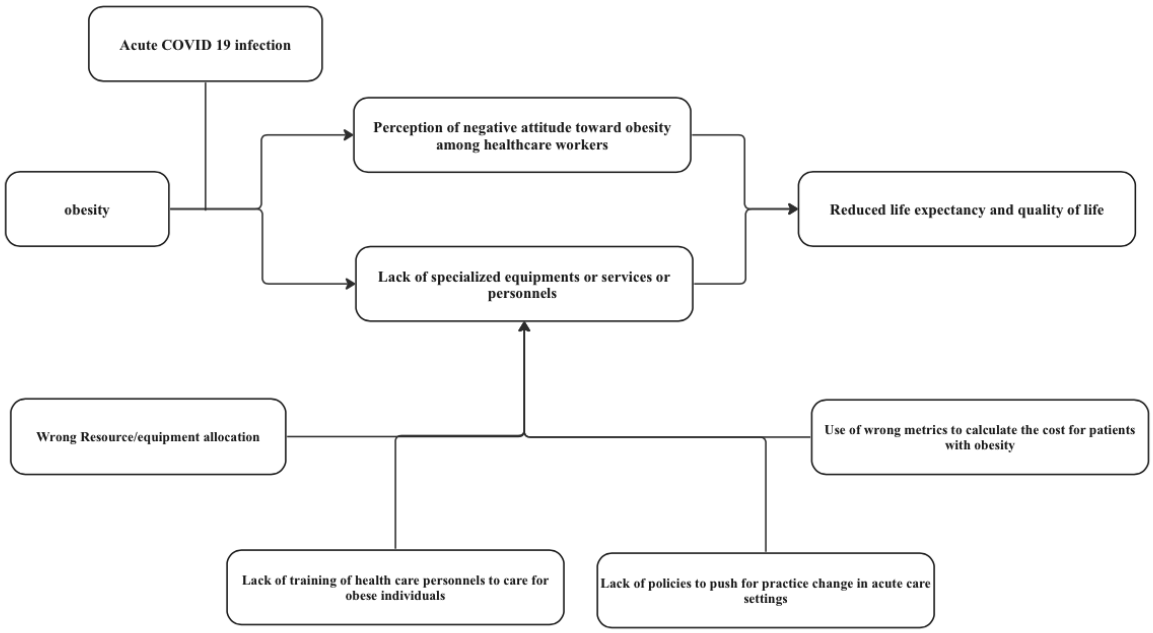
## Challenges faced by critically ill SARSCoV2 patients with obesity

As mentioned earlier, the purpose of this article is to highlight the challenges faced by acutely ill COVID 19 patients with obesity in receiving standardized care while being hospitalized. We believe that understanding the barriers to timely reception of acute care among populations with obesity is a necessary first step towards elimination

of those barriers. In general, patients with severe COVID 19 infections frequently require mechanical ventilatory and circulatory support. In patients with obesity, airway management and obtaining venous access may require specialized equipment. In a review of 'emergencies in obese patients' by Ida di Glacinto et al, it is stated that a prudent approach would be to anticipate difficulties in both oxygenating and ventilating patients with obesity and to prepare in advance for technical failures[14,15]. Use of videolaryngoscopy is recommended for all patients with obesity. Even after successful intubation, atelectasis and decruitment can lead to difficulty in oxygenating these patients, thus requiring more expertise, trained personnel and equipment. Increased thickness of subcutaneous tissue can make peripheral and central venous cannulation difficult, thus necessitating use of specialized equipment and trained personnels[14]. In addition, any patient above 136 kg, described as patient of size in scientific literature, is likely to need specialized beds (with wider margins) and larger rooms in order to avoid complications from lack of mobility and to prevent hospital acquired complications[16]. These special equipment and services, if not made available in a timely manner, are likely to prolong the hospital stay, predispose patients to hospital acquired complications and increase readmission rates.

Prone positioning is practiced widely as it has been shown to improve outcomes in COVID 19 patients with refractory hypoxemia[17]. A meta-analysis by Ashra et al 2022 shows that prone positioning is more likely to benefit patients with class II obesity followed by those with class I obesity compared to patients with normal BMI[18]. Despite adequate evidence for proning in improving the survival of patients, centers that do not have proning beds have not yet widely adopted the practice of manual proning. Obesity, by itself, has been identified as a barrier to proning, in addition to fear of dislodging the endotracheal tube, hemodynamic compromise and risk of injuries to healthcare staff[17]. Patients with obesity do experience challenges in undergoing imaging studies as many hospitals lack equipment that supports patients with obesity. According to the survey conducted across US hospitals in 2008, only 28% of academic hospitals and 10% of non-academic facilities had CT scanners that could fit obese populations[19]. In addition to equipment availability, transporting obese patients and obtaining quality images are other challenges frequently encountered in clinical settings. Increased thickness of adipose tissue leads to increased scattering of ultrasound beams and higher degrees of motion artifacts in CT scans and MRIs[19]. To overcome these hurdles, clinicians have to consider the body habitus of individuals in addition to their medical conditions while ordering imaging studies. This implies that a modality of imaging while optimal for the medical condition might not be useful while taking into account the patient's body habitus, thus further complication care for these patients.

It is evident that caring for acutely ill individuals with obesity entails use of more resources in terms of time, space and personnel. The article by Magazine et al published in 2021 highlights the economic challenges faced by acute care facilities in the current payment schemes to provide care for patients with obesity while simultaneously attempting to create a simplified model to promote cost optimization[16]. It also describes how the usage of wrong metrics can lead to erroneous estimation of costs in caring for obese patients[16]. As shown in the above-mentioned study, the optimal care model for acutely ill obese patients, once developed, should permit health care systems to find the lowest cost of meeting a certain service level (which indicates the percentage of patients accommodated)[16]. In summary, it is obvious that there is an unmet need for equipment and infrastructure that could prevent or delay acute care delivery for patients with obesity. While it may not be possible to equip the health care systems to accommodate every patient, it is possible to prepare them to meet the needs of certain proportions at all times thus reducing the length of stay and level of satisfaction amongst this population[16]. However, meeting these unmet needs will require redirection of resources and policy level changes to push for practice changes.




## Gaps in data

A preliminary survey of 68 countries by Leach R et al in 2020 shows that even high-income countries lack the infrastructure to care for this growing segment of population and they are also struggling with obesity related stigma[20]. It is well known that increasing BMI is associated with increased health care related expenditure, both at the individual and community level. A breakdown of the economic impact of obesity in the US by Hammond et al shows that direct medical costs (expenses in diagnosing and treating obesity related chronic conditions and inpatient treatment costs for acutely ill) constitute a significant proportion of this expenditure in addition to productivity, transportation and human capital costs[21]. As mentioned in the protocol for a meta-analysis by Hales et al 2022, it is unclear whether the increased cost is due to higher need for resources, or need for specialized equipment or both[6]. More data directly correlating the impact of the challenges in health care delivery to obese inpatients will be helpful in resource optimization. Such information will enable implementation of policy level changes to ensure that different types of acute care facilities are equipped adequately to cater the needs of the obese population in their respective service areas.

## Need for policy level changes

Long term comprehensive care that promotes wellness is a necessary component in eliminating the disparities in total. Addressing the childhood food insecurities will help curtail the obesity crisis. However, it is also crucial to equip the current acute care delivery system to be able to handle inherent challenges without jeopardizing the health of the patients. It is evident that hospitals need to adapt individualized strategies to optimally meet the need for this special population in a cost-effective manner. A disease illness framework as advocated by Fastenau et al in 2019 where all the stakeholders including health care providers and policy makers function around values and preferences of individual patients, is likely to cater to the unmet need experienced by this population on an urgent basis[22]. Also, Policy level changes that ensure readiness of acute care facilities for their level of service is of great importance to ensure timely and appropriate care delivery for acutely ill COVID patients with obesity.

## Conclusion

COVID 19 pandemic highlighted the disparities faced by the population with obesity. While the intersection of the COVID -19 pandemic with the ongoing crises of obesity deteriorated the health of individuals with obesity, it also highlighted the potential areas in health care systems where improvisations could translate to tangible health benefits to this population. Addressing the disparities and improving the health of this vulnerable population needs to be one of the top priorities for policy makers.

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