



# The Prevalence of Fat Mass and Its Impact on Nutritional Status in Patients with COVID-19

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## ABOUT THE STUDY

COVID-19 severe pneumonia is related with obesity and steatosis. Patients have elevated levels of pro-inflammatory cytokines and a decreased immunological response. Adipose tissue, in particular, is the organ that is vital. As a result, fat mass must be evaluated rather than the simpler Body Mass Index (BMI), because BMI misses a portion of the obese population. The goal is to assess the link between FM percent and immune-inflammatory response after the tenth day in the ICU. We discovered a changed mechanism of inflammation and immune response characteristic of obesity, which was connected with changes in the amounts of circulating cytokines. In particular, obese patients have higher concentrations of TNF-alpha, MCP-1 and IL-6 which are produced by visceral and subcutaneous adipose tissue and implicated in innate immunity.

In 2009, during H1N1 pandemic, in obese patients it was characterized changing of differentiation of B cells, predisposing to a greater risk of contracting influence, but also of being more contagious towards other people. However, they have impaired memory T cell response and vaccination efficacy. Specifically, reduced response of virus-specific CD8<sup>+</sup> lymphocytes and suboptimal macrophage functionality have been demonstrated, which could explain the low response to the vaccine stimulus. For COVID-19, in Intensive Care Unit (ICU), it was observed that the highest percentage are patients affected by severe obesity, with BMI >35 kg/m<sup>2</sup>. The BMI does not reflect necessarily the Fat Mass (FM). There are evidence that suggest how FM% rather than BMI, predicts inflammatory (TNF-alpha, MCP-1 and IL-6) and immune (leptin) response. These ultimate variables that relates with immune and inflammatory response in FM%. Despite the relationship between FM% and severity of progression

inflammatory response in patients admitted to ICU for underlying infective disease, there are no available data on the relevance of FM% in COVID-19 patients treated in ICU.

In COVID-19 patients it is crucial to find risk factors associated with worse clinical course to allocate appropriate resources. However, population characteristics are fundamental for prognosis. In Italy, COVID-19 mortality is strongly influenced by different comorbidities and 52% of deaths are above 80 years of age, unlike China, for which only 20% are above the same age threshold. In particular, pre-existing pathologies including obesity, cardiovascular co-morbidity, arterial hypertension and type 2 diabetes mellitus are established risk factors. Obesity also can be associated to insulin-resistance that alters immune response. Obese people have increased exhalation infectivity because they have higher ventilator volumes due to a decreased expansion capacity of the thoracic cavity, which inhibits lung expansion. This leads to an increase in aerosol production. Obese people have higher levels of ACE2 expression and are hence more vulnerable to this illness.

The complicated picture is defined by a greater susceptibility to infection and a decreased ability to respond to it. In addition, these patients already present organ damage that induces worse response to treatments. In pre-COVID-19 patients, a personalized and balanced Italian Mediterranean Reference Diet characterized by anti-inflammatory and antioxidant properties, should be adopted as obesity preventive and therapeutic tool. The needed protein intake is based on lean mass content (2 g/kg of lean mass/day), a metric that can be directly measured or computed using prediction equations that are available to all users.

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**Received:** 01-Apr-2022, Manuscript No. JNDT-22-16564; **Editor assigned:** 04-Apr-2022, PreQC No. JNDT-22-16564 (PQ); **Reviewed:** 18-Apr-2022, QC No. JNDT-22-16564; **Revised:** 25-Apr-2022, Manuscript No. JNDT-22-16564 (R); **Published:** 02-May-2022. DOI: 10.35248/2161-0509.22.12.181.

**Citation:** Harry J (2022) The Prevalence of Fat Mass and Its Impact on Nutritional Status in Patients with COVID-19. *J Nutr Disorders Ther.* 12:181.

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