Serious Conditions in COVID-19 Accompanied With a Feature of Metabolic Syndrome

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At the time of this writing, coronavirus disease 2019 (COVID-19) caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) strain of coronavirus has reached pandemic levels, threatening human life and limiting activity worldwide. For the past several months, the clinical characteristics of patients who are likely to develop a serious condition or die from COVID-19 have been gradually revealed from the evidence accumulated by great efforts of frontline health professionals and investigators worldwide [1-3].

Retrospective research has shown that COVID-19 is frequently observed in people with obesity, diabetes, and hypertension [1-13], which are pivotal components of metabolic syndrome (MetS), a cluster of cardiometabolic risks based on excess visceral fat. In addition, the condition and mortality of patients infected with SARS-CoV-2 are likely to be more serious in cases that involve a feature of MetS compared with cases that do not [1, 4-6, 8, 10-13]. Hospitalization, admission to intensive care unit (ICU), and usage of mechanical ventilation are much more prevalent in patients with obesity [4, 5, 14] and diabetes [10, 13], which are the fundamental components of MetS [15].

These facts are undeniable, and yet they may go unperceived by frontline health professionals and the general population alike. One plausible reason for this is that each component of MetS (obesity, diabetes, and hypertension) has been paid attention sporadically and separately in different fields, and not argued comprehensively even in the updated literature.

In recent decades, many investigators have convincingly shown that people with obesity, prediabetes, diabetes and MetS are at increased risk for impaired lung function, and especially impaired restrictive lung pattern [16-22], which is primarily determined by reduced predicted forced vital capacity. Chronic obstructive pulmonary disease, which is familiar to physicians and the general population, and usually determined by reduced forced expiratory volume in 1 s, might play only a minor role in the physiology of impaired lung function observed in patients with MetS or diabetes [16-22].

Consistently, overweight and MetS have been shown to be associated with the severity of influenza A (H1N1) [23-25], although the precise mechanism has not been explored. Therefore, it is reasonable to expect serious condition and high mortality in cases of COVID-19 accompanied by features of MetS because the main target organ of SARS-CoV-2 is the lung.

It is well established that the prevalence rates of MetS and obesity are higher in Americans and Europeans than in Asians [26, 27], which may explain some proportion of the observed differences in severity, hospitalization, and mortality rates of COVID-19 between Western and Asian countries. On the other hand, MetS is far more prevalent in men than in women [1, 2], is associated with chronic kidney disease [28, 29], and may be attributable to the same unknown mechanism mentioned above.

In patients with any of the specific metabolic abnormalities of MetS, pre-existing impaired lung function can predispose them to SARS-CoV-2 infection and even accelerate it, potentially worsening the condition. Plausible pathophysiology for this phenomenon includes impaired immune function, elevated inflammation, insulin resistance, restrictive pattern/reduced lung volume, and elevated expression of receptors of angiotensin converting enzyme 2 (ACE2) and dipeptidyl peptidase 4 (DPP-4) [2, 6-8, 10, 12, 14, 30]. The latter two of these may be particularly notable because the expression of ACE2, a receptor for the entry of SARS-CoV-2 into target cells, and DPP-4 are both increased in patients with obesity and diabetes [6, 12]. Although it has not been definitively established that inhibitors of ACE and DPP-4 influence the predisposition and/or severity of SARS-CoV-2 [31, 32], this possibility deserves further study.

Taken together, the predisposition to infection with viruses including SARS-CoV-2 may represent a serious complication when accompanied by any of the features of MetS, which are mostly preventable or modifiable by diet, exercise, and other aspects of a healthy lifestyle.

Urgent COVID-19 studies are required to confirm the association between serious condition and obesity and diabetes,
investigate the fundamental features of MetS in terms of causality, and explore potential treatments for the multitude of patients all around the world.

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Conflict of Interest

None to declare.

Data Availability

The author declares that data supporting the findings of this study are available within the article.

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