

## Prevention in Daily Life against Progression of COVID-19

Dear Editor,

COVID-19 is a new emerging disease, which has been declared a pandemic in March 2020. Based on several information, elderly people might be at higher risk for severe infections from the COVID-19.<sup>[1]</sup> In addition, the virus might cause serious illness especially in obese patients and smokers. By the way, the recovery rate is the same for Italy and China, whereas infection and death rate appear to be different.<sup>[2]</sup> In those certain host-situations, the virus easily might enter the cells by attaching to angiotensin-converting enzyme-2 (ACE2), which is expressed on pneumocytes of the lower airways. ACE2 is highly expressed in smokers and in underlying disease-patients. Surface spike glycoprotein on the surface of COVID-19 binds to the ACE2. Viral uptake is regulated by a transmembrane serine protease and ACE2. Then, COVID-19 infection becomes more severe in those patients due to high viral load. But, what on earth is the most important risk factor? We have hypothesized the answer as shown in Figure 1.

Gastroesophageal reflux disease (GERD) increases with age and the risk factors for GERD include smoking, male gender, obesity. Its prevalence is increasing in East Asia.<sup>[3]</sup> GERD can cause lung disease due to aspiration of gastric contents and periodontal pathogens. Chronic periodontitis is a serious problem causing considerable sicknesses and enlarged remedial costs in the elderly. Indeed, periodontal pathogens generally seem to be a significant risk factor for aspiration pneumonia. Now, what is the most important risk factor for grave COVID-19 infection? The virus attaches to

the ACE2 at low pH values and straightforwardly enters into the cell causing infection. So, acidic fluids such as gastric juice and/or sour fruits juice might happen to exacerbate the infection, when those fluids would exist with the virus in lung. Particularly in elderly patients with renal failure and/or diabetes, COVID-19 infection will be more severe since tissue pH would be lower.

A protease plays an important role in Severe acute respiratory coronavirus (SARS-CoV) viral replication. In particular, the SARS-CoV papain-like protease is essential for virus replication and is conserved among human coronaviruses.<sup>[4]</sup> An inhibitor of the proteinase of coronavirus strongly could reduce virus replication. In this way, several protease containing fruits juice and/or vegetables juice, such as papain in papaya, bromelain in pineapple, actinidin in kiwifruit, and zingipain in ginger might also happen to exacerbate the COVID-19 infection, if those fluids would co-exist in the lung. Smoking can upregulate the lung gene expression of ACE2, the receptor of COVID-19. Smoking was found to be a significant predictor of COVID-19 severity. On the contrary, it has been reported from statistical meta-analysis that active smoking is not associated with severity of COVID-19.<sup>[5]</sup> In general, smokers and/or underlying disease-patients are vulnerable to respiratory viruses.

As the efficiency of pharmacological and/or vaccinal treatments has been imperfect and might have unexpected side effects at present (25<sup>th</sup>, April, 2020), lifestyle factors such as the special diet and non-smoking habits could play certain protectoral roles against becoming severe infection of COVID-19.

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### Conflicts of interest

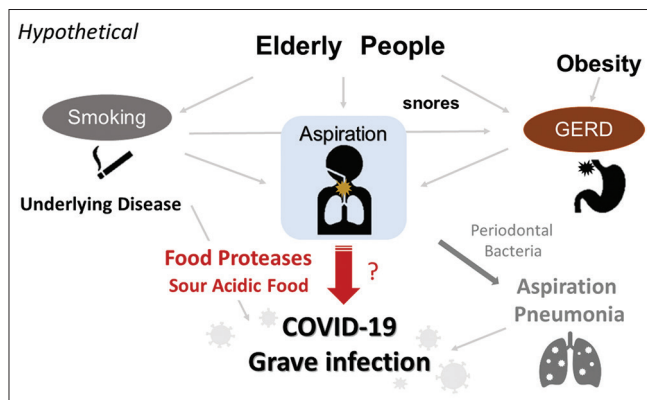
There are no conflicts of interest.

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**Figure 1:** Schematic diagram of the tentative proposed model indicating the risk factors for grave infection of COVID-19. Note that some critical pathways have been omitted for clarity. GERD: Gastroesophageal reflux disease

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## References

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