

**Letter to Editor****New insight on nutrition and COVID-19 pandemic****Bachir Benarba<sup>1</sup>  and Meghit Boumediene Khaled<sup>2</sup> **

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Dear Editor,

The new emerging COVID-19 pandemic is caused by the coronavirus SARS-CoV-2 infection, first reported in Wuhan (China), that conveys a serious threat globally to health and economy because of a lack of vaccines and specific treatments. The pandemic is threatening the food security and nutrition of millions of people worldwide.

The aim of this letter to editor is to summarize the most recent studies (cohort, case control, prospective, retrospective, descriptive observational, and cross sectional studies) carried out on the relationship between immunity against COVID-19 and nutrition. It has been established that deficiency in some vitamins and minerals could decrease the immune defense and favor progression to severe disease and complications. A positive association between vitamin D deficiency and the severity of the disease has been pointed out in several investigations, especially among the elderly people<sup>1</sup> who displayed also high prevalence of nutritional risk and malnutrition.

Nutrition risk among COVID-19 patients is a modifiable factor that could be controlled and reduced or controlled with early, individualized nutritional therapy. Although some micronutrients play a key role in the immune system and the protection of the respiratory tract such as vitamin D, antioxidants, vitamin C, vitamin A and E, zinc, and folate, to date, no conclusive evidence supporting novel nutritional therapy or showing that high-dose micronutrient supplements will prevent serious disease or could speed recovery<sup>2</sup>. Preventing pathologies related to nutrition such as diabetes and obesity will certainly reduce the risk and mortality of COVID-19 infection. Further research is required to establish optimal public health practice and clinical intervention regimens to correct micronutrients deficiencies in COVID-19 affected patients especially those at highest risk.

**Table 1:** Recent findings on COVID-19, micronutrients, and nutritional status

Type of study/ participant	Country	Key findings	Ref.
1. Observational study/50	Korea	COVID-19 Patients with selenium and vitamin D deficiencies are at high risk of severe complications.	3
2. A Pilot Cohort study/21 patients with severe COVID-19	USA	Severe COVID-19 was associated with low levels of vitamins C and D. Advanced age and decreased vitamin C levels were	4

		associated with increased mortality.	
3. Single-center cohort study/129	Italy	Severe vitamin D deficiency was found to be prevalent in hospitalized COVID-19 patients.	5
4. Case control study/63 cases and 60 controls	Iran	Vitamin D deficiency was correlated to the severity of COVID-19. Vitamin D levels lower than 10 ng/mL were found in the patients deceased.	6
5. Prospective study/109	Italy	Old COVID-19 patients with impaired nutritional status are at high risk of mortality.	7
6. Descriptive observational study/41	Morocco	Most of patients had, or were at high risk of undernutrition (hypoalbuminemia, hypoproteinemia, hypocalcemia, anemia, hypomagnesemia), and vitamin D deficiency. Moreover, patients with impaired nutritional status required longer intensive care periods.	8
7. Prospective cohort study/213	Italy	Higher risk of malnutrition besides weight loss were prevalent in COVID-19 patients. These two factors were associated with systemic inflammation, impaired renal function and longer disease duration.	9
8. Case control study /60 cases and 60 controls	India	COVID-19 patients had lower selenium levels when compared to healthy persons .	10
9. Cross-sectional study/35	Germany	COVID-19 patients had lower Zn levels when compared to healthy persons. Interestingly, significantly reduced Zn levels were found in non-survivors when compared to the survivors.	11
10. Multicenter retrospective observational study/523	China	Lower BMI and reduced and plasma protein levels were correlated with the severity of COVID-19. A modified NUTRIC score (without the IL-9 value) was found to possess a predictive potential of COVID-19 related deaths in hospitalized patients, especially those admitted in the intensive care units.	12
11. Retrospective cohort/200	USA	In the first 200 COVID-19 patients in New-York city, severe obesity was found to be the most important risk factor associated with the risk of intubation and death (BMI $\geq 35$ kg/m <sup>2</sup> : 34.8%).	13

12. Retrospective, registry-based/16540	USA	Vitamin D deficiency multiplies by 4.6 the risk to be infected by the COVID-19. Likewise, obesity was found to be a risk factor of COVID-19 (obesity (with OR=2.27; 95% CI: 1.787 - 2.872, P<0.001)	14
13. Prospective study of hospitalized patients/160	France	The malnutrition was associated with the severity of COVID-19, increasing from 42.1% in all patients to 66.7% in those admitted in the intensive care units. Moreover, reduced albumin levels were found to be an independent predictive factor of severe COVID-19 needing intensive care.	15
14. One-day clinical audit of nutritional status/268	Italy	Nutritional risk was found in 77% of the included patients whereas malnutrition was detected in 50% of them. Besides, lower energy and protein intake were associated with severity of the disease.	16
15. Retrospective study/107	China	An important prevalence of hypocalcemia (62.6%) was found in COVID-19 patients, and was demonstrated to be associated with poor outcome.	17

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