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Analytic Study

Human Corona Virus Infection and Role of Nutrition

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Abstract

In the 21st century, 2 highly pathogenic Human corona viruses (HCoVs) -severe acute respiratory syndrome corona virus (SARS-CoV) and Middle East respiratory syndrome corona virus (MERS-CoV)-emerged from animal reservoirs to cause global epidemics with alarming morbidity and mortality. The transmission of 2019-nCoV may occur predominantly through direct mucous membrane (nose, mouth or eye) contact with infectious respiratory droplets within close vicinity of an infected person. Nutritional support can help prevent the occurrence of acute infection. Foods rich in zinc, omega-3 fatty acids, vitamin C and probiotics help in prevention and treatment of human corona virus infection. Warming foods also play an important role in boosting human immunity against viral infections.

Introduction

Since the discovery of first human corona virus (HCoV) for over 50 years, Overall six HCoVs have been identified including HCoV-229E and HCoV-OC43 (first identified in the 1960s), SARS-CoV (in 2003), HCoV-NL63 (in 2004), HCoV-HKU1 (in 2005) and Middle East respiratory syndrome corona virus

(MERS-CoV) (in 2012) [1]. Zoonotic corona viruses such as SARS-CoV and MERS-CoV, crossed barrier and lead to epidemic in humans. MERS-CoV as the most recent novel corona virus emerged in human can cause severe, life-threatening disease and potential threat to global public health and economy. Since 2012, MERS cases, including those transmitted from Arabian camels were reported to World Health Organization (WHO) almost every month [2]. In May 2015, a returned traveler with MERS-CoV infection caused a significant outbreak in South Korea, which spread to 186 patients and over 16,000 people were quarantined. This outbreak raised the fear that a pandemic like SARS would reoccur [3]. In the 21st century, 2 highly pathogenic HCoVs- severe acute respiratory syndrome corona virus (SARS-CoV) and Middle East respiratory syndrome corona virus (MERS-CoV)- emerged from animal reservoirs to cause global epidemics with alarming morbidity and mortality. In December 2019, yet another pathogenic HCoV, 2019 novel corona virus (2019-nCoV), was recognized in Wuhan, China, and has caused serious illness and death [4]. In temperate climates, the four non-SARS, non-MERS CoV human corona viruses (HCoV-229E, HCoV-OC43, HCoV-NL63, and HCoV-HKU1) occur primarily in the winter months. However, infections have been detected throughout the year. Spread is by contact with infected secretions or by large aerosol droplets, so close contact increases risk of transmission. Current evidence points to camels as primary hosts and a likely animal source for human cases, though bats also are a reservoir. Person to person transmission has been seen in case clusters, mostly in healthcare facilities and involve close contact in the absence of infection control precautions - the mechanism is felt to be droplet or contact transmission as with other corona viruses [5].

Clinical Manifestations of Infection with this Microorganism

In addition to acute upper respiratory tract infections, corona viruses have also been linked to otitis media, asthma exacerbations, and community acquired pneumonias in children and adults. There are some studies that link corona viruses to diarrhea disease in infants; however, no clear causal link has yet been determined. For SARS, most cases of severe disease occurred among adults, not children [6]. Those at most risk for severe disease and death from SARS include the elderly, those with diabetes or other co-morbid conditions, those with an atypical presentation, and those with high LDH. Most patients with SARS presented with a nonspecific viral prodrome with malaise, fatigue, and fever. Respiratory symptoms were not initially present, but dyspnea progressing to respiratory distress followed in patients who developed severe illness. This lung disease is the hallmark of SARS and patients most often died of respiratory distress and multi-organ failure. As with SARS, the primary clinical feature in MERS CoV has been fever and severe pulmonary disease, including pneumonia and acute respiratory distress syndrome. A subset of cases has additionally developed acute kidney injury. Other less common findings include pericarditis, nausea, vomiting, abdominal pain, and diarrhea and disseminated intravascular coagulation [7].

Epidemiological Analysis

1. The outbreak of the 2019-n CoV happened in winter (that is, December, 2019 to January, 2020), the same months as SARS-CoV (December 2002 to January, 2003) [8].

2. There were strong evidences of human-to-human transmission of 2019-nCoV among the close contacts of infected patients [9].

3. Among the first 425 patients, the median age was 59 years and 56 per cent were male. The mean incubation period was 5.2 days with the 95th percentile of the distribution at 12.5 days, and the basic reproductive number was estimated to be 2.2 [10].

4. Importantly, there were 2019-n CoV-infected people with no obvious clinical symptoms or long incubation period but were still capable of infecting other people in close contact [11]. These asymptomatic infected people may pose a serious risk for the transmission of infection to healthy population.

Transmission

Similar to SARS-CoV, the transmission of 2019-nCoV may occur predominantly through direct mucous membrane (nose, mouth or eye) contact with infectious respiratory droplets within close vicinity of an infected person, and/or through exposure to fomites, such as hand-to-mouth (or hand-to-nose and hand-to-eye) contact with fomites and inhalation of virus-containing aerosols generated from the evaporation of respiratory droplets produced by patients during coughing, sneezing or even talking [12-13]. Research on SARS-CoV indicates that the aerosol should not be distributed evenly in an enclosed space, that is, the aerosol concentration decays as one move away from the source [14]. Thus, close or long-term contact with an infected patient is considered to be a major risk factor for infection. The 2019-nCoV can have a long incubation period of up to 14 days and a more worrying feature of the 2019-nCoV is that asymptomatic or mild cases could transmit the virus to other healthy people [15-16]. There are also 2019-nCoV infected patients that have developed respiratory failure and severe pneumonia after infection of 2019-nCoV, many of them are older patients with some underlying diseases [17-18].

A Perspective Nutrition Support May Help to Prevent 2019-NCOV

Dynamically assess the patients' nutritional risks and timely nutritional support can be given if needed. According to the patients' condition, provide high-protein, high-vitamin; carbohydrate-containing diets (e.g. eggs, fish, lean meat, milk, etc.) for enough nutrition to improve physical condition. For the patients who can eat, the diet rich in protein and carbohydrates is recommended. Those patients who cannot eat but are compatible with enteral nutrition should be given enteral nutrition as soon as possible. For the patients incompatible with enteral nutrition, parenteral nutrition should be given timely to meet energy requirement. Inpatients are screened for nutrition risk based on the NRS2002 (nutrition risk screening) score when they are admitted to the hospital. The recommended plan for patients with different nutrition risk scores are as follows:

First, if the total score is <3 points, it is recommended to eat protein-rich foods (such as eggs, fish, lean meat, dairy products) and carbohydrate-containing diets. The supposed ideal energy intake is 25-30kcal/(kg·d) and the protein mass are 1.5g/(kg·d).

Second, if the total score is ≥ 3 points, the patient should be given nutritional support as early as possible. It is recommended to increase protein intake by oral nutrition supplement, 2-3 times/day ($\geq$ 18g protein/time). In order to reach the amount of 18g protein/time, protein powder can be added on the basis of standard whole protein preparations. Enteral nutrition tube should to be placed when the patient cannot intake supplemental nutrition by oral routine [19].

The role of certain dietary supplements in the prevention or treatment of URIs is discussed below.

Zinc Lozenges

Zinc ions inhibit rhinoviruses (which constitute roughly 80% of cold viruses) through several mechanisms: prevention of viral replication, potentiation of the antiviral action of native human interferon; and stimulation of T-cells. One meta-analysis found that zinc lozenges reduce the duration of colds by nearly three days, while a systematic review found zinc lozenges reduced the duration of colds by 42%. Patients should be cautioned that irritation of the oral mucosa and mild gastrointestinal complaints are common with zinc lozenges. Zinc in intranasal gel or spray forms have not been found effective [20].

Fatty Acids

Several studies have found that supplementation with long chain omega-3 fatty acids (EPA and DHA) reduces the incidence of URI in infants and children [21].

Vitamin D Supplementation

Controlled trials have revealed the ability of vitamin D supplements (4000-10,000 IU/day) to significantly reduce the incidence of URI [22].

Vitamin C

The utility of vitamin C for preventing or treating colds is widely accepted in the general population. However, most evidence supports the efficacy of megadoses for upper respiratory infections only for individuals who are under significant physical or environmental stress, such as marathon runners, skiers, soldiers, and people exposed to severe cold [23]. In persons taking vitamin C supplements, the relative risk for developing colds was reduced by 50% as compared with the risk in individuals not using supplements [24].

Sesame Oil

There is a theoretical analysis and assumption of the possibility of using sesame oil to prevent viral infection: sesame oil is an edible vegetable oil derived from sesame seeds. When sesame oil is added and coated to a person's two nostrils, the sesame oil may wet the nasal mucosa and act as a large area of protective layer. In addition, sesame oil has a high boiling point of about 215˚C, thus the protective layer may remain for a long time. the protective layer of sesame oil onto the nasal mucosa may has a suitable surface tension, viscosity, adhesion and thickness to catch and trap the virus particles when a person is breathing with his nose, and thus preventing the direct contact and binding of virus onto the surface of nasal mucosa [25]. To achieve better protection effect, a person could also slowly drink some sesame oil and keep some sesame oil in the mouth and thus let the sesame oil cover the mucosal surface of oral cavity and throat. This may further increase the protected area and thus reduce the chance of infection by virus during talking or mouth breathing and may be especially useful in high-risk areas, such as hospital environment or family environment with patients. If the sesame oil method can really work, that is, sesame oil can inactivate the 2019-nCoV or prevent the infection of 2019-nCoV, there are also some helpful suggestions: For the asymptomatic infected people,

we can examine if it is possible to inactivate the 2019-nCoV in their bodies (or upper respiratory tracts) by adding sesame oil to their nostrils and mouth, since sesame oil is capable of permeating and entering the blood stream through the capillaries. Sesame oil can be applied to the surface of frequently contacted objects, such as tables, door handles, hands and faces. Because sesame oil has a low surface tension and a high boiling point, sesame oil can wet the surface of various objects and can also maintain for a longer time. Sesame oil can be sprayed into the air, for example, spraying sesame oil around infected patients and to inactivate the virus aerosols around patients. The inhalation of sesame oil molecules to patients' nostrils and lungs could be non-toxic and perhaps even beneficial. Napkin containing sesame oil can be used to cover the nose and mouth before the wearing of a mask [26].

Warm Foods

Foods such as ginger, dates, citrus, etc are known to improve blood circulation and energy production, anti-inflammatory and antiviral foods such as garlic, onion, shallot, leek, and chive are also good, There is no evidence that garlic can fight corona virus. However, garlic is known to have numerous indirect effects. It has antioxidant activity, lipid (cholesterol and triglyceride) lowering, platelet aggregation inhibition, enhancement of fibrinolytic activity, prolongation of bleeding and clotting time, and prevention of LDL oxidation. It also possesses anti-inflammatory properties, hypoglycemic actions, digestive effects and cleansing actions. As a whole, garlic can improve micro circulation in the lungs, improve the immune function or promotes the holistic health [27].

Other Foods

Eating organic whole plant foods with good amounts of leafy greens and fiber-rich foods (legumes, whole grains, beans and vegetables), avoiding animal products including (poultry, fish, pork, beef, and dairy) and adding a lactobacillus probiotic to the everyday routine are key factors. Protecting from disease goes beyond washing hands and wearing a mask. It requires providing the body with the appropriate defense mechanism to allow it to stay strong even during times of biological threat [28].

Bibliography

1. Zaki, A. M., Van Boheemen, S., Bestebroer, T. M., *et al.* (2012). Isolation of a novel corona virus from a man with pneumonia in Saudi Arabia. *N Engl J Med., 367,* 1814-1820.

2. de Groot, R. J., Baker, S. C., Baric, R. S., *et al.* (2013). Middle East respiratory syndrome corona virus (MERS-CoV): announcement of the Corona virus Study Group. *J Virol., 87*(14), 7790-7792.

3. Kim, K. H., Tandi, T. E., Choi, J. W., *et al.* (2017). Middle East respiratory syndrome corona virus (MERS-CoV) outbreak in South Korea, 2015: epidemiology, characteristics and public health implications. *J Hosp Infect., 95*(2), 207-213.

4. Paules, C. I., Marston, H. D. & Fauci, A. S. (2020). Corona virus Infections - More Than Just the Common Cold. *JAMA., 323*(8), 707-708.

5. Balboni, A., Battilani, M. & Prosperi, S. (2012). The SARS-like corona viruses: the role of bats and evolutionary relationships with SARS corona virus. *New Microbiol., 35,* 1-16.

6. Prill, M. M., Iwane, M. K. & Edwards, K. M. (2012). Human corona virus in young children hospitalized for acute respiratory illness and asymptomatic controls. *Pediatr Infect Dis J., 31*(3), 235-240.

7. Hui, D. S. & Chan, P. K. (2010). Severe acute respiratory syndrome and corona virus. *Infect Dis Clin North Am., 24*(3), 619-638.

8. Wang, Chen, *et al.* (2020). A novel corona virus outbreak of global health concern. *The Lancet, 395*(10223), 470-473.

9. Du Toit & Andrea (2020). Outbreak of a novel corona virus. *Nature Reviews Microbiology, 18*(3), 123.

10. Li, Qun, *et al.* (2020). Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus-Infected Pneumonia. *New England Journal of Medicine, 382,* 1199-1207.

11. Rothe, Camilla, *et al.* (2020). Transmission of 2019-nCoV Infection from an Asymptomatic Contact in Germany. *New England Journal of Medicine, 382,* 970-971.

12. Stanley & Perlman (2020). Another Decade, another Corona virus. *New England Journal of Medicine, 382,* 760-762.

13. Liu, Tao, *et al.* (2020). Transmission dynamics of 2019 novel corona virus (2019-nCoV). *bioRxiv,* 1-27.

14. Gostic, Katelyn, *et al.* (2020). Estimated effectiveness of traveler screening to prevent international spread of 2019 novel corona virus (2019-nCoV). *medRxiv.,* 1-19.

15. Wu, Joseph, T., Kathy Leung & Gabriel Leung, M. (2020). Now casting and forecasting the potential domestic and international spread of the 2019-nCoV outbreak originating in Wuhan, China: a modelling study. *The Lancet, 395*(10225), 689-697.

16. Chan, Jasper Fuk-Woo, *et al.* (2020). A familial cluster of pneumonia associated with the 2019 novel corona virus indicating person-to-person transmission: a study of a family cluster. *The Lancet, 395*(10223), 514-523.

17. Paules, Catharine, I., Hilary Marston, D. & Anthony Fauci, S. (2020). Corona virus Infections-More Than Just the Common Cold. *JAMA., 323*(8), 707-708.

18. Heymann & David, L. (2020). Data sharing and outbreaks: best practice exemplified. *The Lancet, 395*(10223), 469-470.

19. Jin, Y., Cai, L., Cheng, Z., *et al.* (2020). A rapid advice guideline for the diagnosis and treatment of 2019 novel corona virus (2019-nCoV) infected pneumonia (standard version). *Military Med Res., 7*(1), 4.

20. Hemilä, H., Petrus, E. J., Fitzgerald, J. T., *et al.* (2016). Zinc acetate lozenges for treating the common cold: an individual patient data meta-analysis. *Br J Clin Pharmacol., 82*(5), 1393-1398.

21. Hageman, J. H., Hooyenga, P., Diersen-Schade, D. A., *et al.* (2012). The impact of dietary long-chain polyunsaturated fatty acids on respiratory illness in infants and children. *Curr Allergy Asthma Rep., 12*(6), 564-573.

22. Goodall, E. C., Granados, A. C., Luinstra, K., *et al.* (2014). Vitamin D3 and gargling for the prevention of upper respiratory tract infections: a randomized controlled trial. *BMC Infect Dis., 14,* 273.

23. Bergman, P., Norlin, A. C., Hansen, S., *et al.* (2015). Vitamin D supplementation to patients with frequent respiratory tract infections: a post hoc analysis of a randomized and placebo-controlled trial. *BMC Res Notes., 8,* 391.

24. Hemilä, H. & Chalker, E. (2013). Vitamin C for preventing and treating the common cold. *Cochrane Database Syst Rev.,* (1), CD000980.

25. Fan, Wen, *et al.* (2016). Three-dimensional all-dielectric met material solid immersion lens for sub wavelength imaging at visible frequencies. *Science Advances, 2*(8), e1600901.

26. Fan, Wen, *et al.* (2015). Centrifugation-assisted assembly of colloidal silica into crack-free and transferrable films with tunable crystalline structures. *Scientific Reports, 5,* 12100.

27. Alice, M., Tang, E. S. & Semba, R. D. (2013). Nutrition and Infection, in: Kenrad E., Nelson C.M.W., editors. (eds.) Infectious Disease Epidemiology: Theory and Practice, 3rd edn. Burlington, MA: Jones & Bartlett Learning.

28. Losasso, C., Eckert, E. M., Mastrorilli, E., Villiger, J., Mancin, M., Patuzzi, I., *et al.* (2018). Assessing the influence of vegan, vegetarian and omnivore oriented westernized dietary styles on human gut microbiota: A cross sectional study. *Front. Microbiol., 9,* 317.