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Long COVID Syndrome Associated Clinical Characteristic on the Qinghai Plateau and Plateau Plants Treatment Strategies

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Abstract

Long Covid is an emerging public health public problem; the ligering symptoms after Covid-19 infection can last weeks to months. At present, no pharmacologic agent has been know that effectively reduces or abolishes the symptoms of long COVID. The aim of this study was to describe the long term health of patients with confirmed COVID-19 who have discharged from QingHai fourth people's hospital (QingHai, China) and investigate clinical characteristic of long Covid syndrome by using questionnaires and case review in 1000 discharged adult patients and 156 discharged pediatric patients. In addition to describing therapeutic strategies, this study explores the potential effect of highland plants on the treatment of long Covid syndrome and is innovative in that it opens up new possibilities for future research and clinical practice.

Keywords: Long Covid-19; Plateau; Clinical characteristic; Fatigue; Plateau Plants; Treatment strategies.

Introduction

At least 65 million individuals around the world have long COVID, based on a conservative estimated incidence of 10% of infected people and more than 651 million documented COVID-19 cases worldwide [1]. By December 8th 2023, more than 772 million individuals were infected with over 6.98 million deaths worldwide. According to World Health Organization (WHO) [2]. COVID-19 still deserves our attention and research. SARS-COV-2 has been evolving quickly in past three years, and multiple variants have gained increased abilities to infect patients or evade the protection by vaccination [3]. So long COVID will remain a global challenge to health care system and economy [4,5]. After the acute phase of a SARS-COV-2 infection, a proportion of those infected show persistent somatic symptoms over weeks, months and even years, including general tiredness, muscle pain, difficulties when breathing, chest pain [6]. This post COVID-19 condition is termed" long COVID" [7-9]. Many patients experiencing dozens of symptoms across multiple organ systems [10-12]. There are currently no validated effectively treatments. WHO has made a clinical case definition to the public in delineating long COVID," post COVID-19 condition occurs in individuals with a history of probable or confirmed SARS-COV-2 infection, usually 3 months from the onset of COVID-19 with symptoms that last for at least 2 months and cannot be explained by an alternative diagnosis [13,14]. The National Institute for Health and Care Excellence (NICE) defined post COVID-19 syndrome as "signs and symptoms that develop during or after an infection consistent with COVID-19, continue for more than 12 weeks and are not explained by an alternative diagnosis". Additionally, symptoms appearing during a timeframe of four to twelve week post COVID-19 onset are regarded as ongoing symptomatic COVID-19 [15,16]. We designed a follow-up questionnaire for post-COVID-19 syndrome in individuals dis-

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charged from the Fourth people's Hospital of QingHai Province. The study included 100 discharged adults and 86 discharged children October 23, 2022 and January 11, 2023. The aim is to explore differences in post-COVID-19 syndrome among patients of different age groups, providing a more comprehensive understanding of the clinical manifestations of post-COVID-19 syndrome in the QingHai region. QingHai is located on an elevated plateau, has an average altitude of more than 3,000 meters and has climate characteristics of low oxygen, dryness and strong ultraviolet rays [17-21]. Which have a unique impact on the lives and health of residents. Our study compared symptom presentations of long-term COVID-19 recoverers in Qinghai Plateau with those in low-altitude regions to understand high-altitude COVID-19 characteristics [22-24]. Additionally, we explored the therapeutic potential of plateau plants in long COVID-19 treatment.

Material and methods

Study design and patients

For this retrospective study, we enrolled 1000 discharged adults and 156 discharged children from the Fourth People of QingHai province from October 23, 2022 and January 11, 2023. The time since discharge from the hospital of all subjects was more than 1 months. The discharge criteria for all survivor also followed the World Health Organization interim guidance. The selected survivors were enrolled onto a telephone follow-up study primarily to observe their clinical sequelae in early recovery from COVID-19. This study was approved by the ethics commissions of the Fourth People of QingHai province. Oral consent was obtained from patients.

Data collection

The demographic, clinical and treatment were obtained from patients' medical records. Survivors were systematically contacted by three experienced clinicians via mobile Phone, and the detailed reported symptoms related to the key points we were assessing were recorded. Median values were compared by Mann-Whiney test.

Statistical analysis

Categorical variables were described as proportions and percentages, and continuous variables were described using median and range (min-max) values. Statistical analyses were done using the Graphpad Prism software, version 8.02. For unadjusted comparisons a two-sided α of less than 0.05 was considered statistically significant.

Results

Demographics and characteristics

The median (IQR) age of the 1000 Covid-19 adults survivors was 44.0 years, ranging from 18 to 76 years, 560 patients (56%) were female. The median (IQR) age of the 156 COVID-19 children survivors was 4.0 years, ranging from 1 to 17 years, and 73 patients (47%) were female. Their age distribution, clinical symptoms and treatment time are shown in Table 1. The sex ratio, age distribution between two cohorts showed no significant difference (P>0.05).

Characteristics of clinical sequelae

On the basis of follow-up results, compared to the COVID-19 children survivors, cough, fatigue, myalgia, loss of olfactory and gustatory function, throat pain, chest pain, dyspnea, depression, memory loss, anxiety, dizziness, cardiovascular-related symptoms were significantly higher in COVID-19 adults survivors (all P<0.05) (Table 1).

Treatment

All adults patients and children patients received antiviral Treatment. Within the adults COVID-19 patients cohort, 32% underwent Oxygen therapy, while 1% received antibiotic treatment. Conversly, among pediatric patients, 5.1% underwent oxygen therapy, with 0.6% receiving antibiotic treatment (Table 2).

Post-COVID-19 patients experiencing COVID symptoms (fatigue, headache, cough, loss of smell and taste, hair loss, muscle pain, depression, heart discomfort, and anxiety) within one month of discharge, they were randomly divided into two groups: a treatment group and a control group. The treatment group was given oral liquid preparations of Rhodiola and sea buckthorn. Follow-ups were conducted one month later (Table 3).

Table 3 shows Significant relief of fatigue, headache, respiration insufficiency, loss of smell and taste, cough, hair loss, pain in joints, muscles, cognitive functions (attention, memory), mood disorders (anxiety, and depression) and physical activity over time of treatment and the follow-up period was observed in treatment group of patient. In particular, the number of patients with symptoms of fatigue and mood disorders was less in the treat group than in the control group.

Table 1: Treatment in 1000 adult patients and 156 child patients with Covid-19.

Characteristic	COVID-19 adults survivor (n=1000)	COVID-19 children survivor (n=156)	P
Age, median(range)	44(22-76)	4(1-17)	
Sex			
Male	440(44%)	83(53%)	0.085
Female	560(56%)	73(47%)	0.085
Clinical feature in hospital			
Cough	60(6%)	8(5.1%)	0.723
Fever	0	0	2
fatigue	150(15%)	5(3.2%)	0.001
Myalgia	30(3%)	0	0.029
Loss of olfactory and gustatory function	60(6%)	5(3.2%)	0.22
Throat pain	40(4%)	2(1.2%)	0.124
Chest pain	100(10%)	0	0.001
Headache	0	0	2
Dyspnea	10(1.0%)	0	0.21
Depression	40(4%)	2(1.2%)	0.045
Memory loss	30(3%)	0	0.029
Anxiety	25(2.5%)	0	0.047
Dizziness	40(4%)	0	0.045
Cardiovascular-related symptoms	40(4%)	2(1.2%)	0.045
Treatment time, median (range)	18(3-22)	16(3-20)	

Table 2: Treatment in 1000 adult paitients and 156 child patients with Covid-19.

Treatment	COVID-19 adults patients	COVID-19 children patients
Oxygen therapy		
High-flow nasal cannual or mechanical ventilation	320(32%)	8(5.1%)
Antiviral treatment		
Oseltamivir	400(40%)	30(19.2%)
Ribavirin	300(30%)	20(12.8%)
Azvudine	130(13%)	0
Traditional Chinese medicine	1000(100%)	156(100%)
Antibacterial treatment		
Cefotaxime	0	1(0.6%)
Azithromycin	10(1%)	0
Adjuvant therapy		
Vitamin C	600(60%)	80(51.2%)
Treatment time, median(range)	18(3-22)	16(3-20)

Table 3: Duration (days) of symptoms from the day of randomization and the significance of the difference between treatment group and control group.

	Treatment group		Control group		P
	Mean	n	Mean	n	
Fatigue, days	20	50	28	49	<0.001
Headache, days	7	25	10	26	0.0372
Hair loss, days	27	30	30	29	0.0249
Respiration problems, days	7	12	12	13	0.0201
Cough, days	11	13	17	16	0.0034
Muscles pain	11	22	15	24	0.0095
Chest pain	13	11	15	10	0.3714
Depression	13	28	20	26	<0.001
Anxiety	13	29	20	30	<0.001

Discussion

In QingHai province, Adults survivors of COVID-19 are significantly more likely to develop clinical sequelae 1 month after discharge from the hospital than children survivors. Fatigue symptoms, in particular, are notably pronounced. This conclusion aligns with the findings of many research studies [25,26]. Of the adults COVID-19 survivors experiencing fatigue symptoms, we found that the median age was 56 years, higher than that of who did not experience fatigue symptoms (P<0.05) this finding suggests that age plays a crucial role in fatigue symptoms among long COVID-19.

A study found that among adult COVID-19 survivors discharged from RenMin Hospital of WuHan University three months, 28.3% experienced fatigue symptoms [27]. The incidence is significantly higher than that of fatigue symptom in QingHai province. It indicates that at high-altitude, the proportion of fatigue syndrome is lower compared to low altitude. In our study, we found plateau plants such as Rhodiola and sea buckthorn in the treatment strategy for COVID syndrome is significant relief of fatigue, headache, respiration insufficiency, loss of smell and taste, cough, hair loss, pain in joints, muscles, cognitive functions (attention, memory) mood disorders (anxiety, and depression) and physical activity over time of treatment and the follow-up period was observed in treatment group of patient. The use of plateau plants in treating fatigue syndrome related to COVID-19 in plateau may be a promising therapeutic approach. Plateau plants often possess adaptations to high-altitude, and their bioactive components may positively impact alleviating fatigue symptoms [28,29].

Firstly, some plateau plants such as Rhodiola, saffron, and sea buckthorn are found to contain abundant alkaloids, flavonoids, and other compounds, which have antioxidative, anti-inflammatory, and immune-regulating effects [30,31]. By consuming extracts of these plants, it is hoped to alleviate oxidative stress to some extent, reduce inflammation levels, and enhance immune system activity.

Secondly, some plateau plants have traditionally been used to improve the body's tolerance to hypoxia [32-36]. These plants may help improve oxygen supply to patients, alleviate symptoms such as difficulty breathing, and thus have a positive impact on fatigue.

References

1. Izquierdo-Condoy JS, Fernandez-Naranjo R, Vasconez-González E, Cordovez S, Tello-De-la-Torre A, Paz C, et al. Long COVID at Different Altitudes: A Countrywide Epidemiological Analysis. Int J Environ Res Public Health. 2022; 19(22): 14673.
2. World Health Organization. https://covid19.who.int/.
3. World Health Organization (WHO). Director General's opening remarks at the media briefing on COVID-19. 2020.
4. Euro surveillance editorial team. Note from the editors: World Health Organization declares novel coronavirus (2019-nCoV) sixth public health emergency of international concern. Euro Surveill. 2020; 25(5): 200131e.
5. WHO. WHO/Europe. Coronavirus disease (COVID-19) outbreak - WHO announces COVID-19 outbreak a pandemic (Online).
6. Ballering AV, Van Zon SKR, Olde Hartman TC, Rosmalen JGM. Lifelines Corona Research Initiative. Persistence of somatic symptoms after COVID-19 in the Netherlands: An observational cohort study. Lancet. 2022; 400(10350): 452-461.

7. Assaf G, Davis H, McCorkell L. What does COVID-19 recovery actually look like? Patient Led Research. 2020.

8. Goërtz YMJ, Van Herck M, Delbressine JM, Vaes AW, Meys R, et al. Persistent symptoms 3 months after a SARS-CoV-2 infection: the post-COVID-19 syndrome? ERJ Open Res. 2020; 6(4): 00542-2020. doi: 10.1183/23120541.00542-2020.

9. Dennis A, Wamil M, Alberts J, Oben J, Cuthbertson DJ, et al. COVERSCAN study investigators. Multiorgan impairment in low-risk individuals with post-COVID-19 syndrome: A prospective, community-based study. BMJ Open. 2021; 11(3): e048391.

10. Ladds E, Rushforth A, Wieringa S, Taylor S, Rayner C, et al. Persistent symptoms after Covid-19: qualitative study of 114 long Covid patients and draft quality principles for services. BMC Health Serv Res. 2020; 20(1): 1144.

11. Kingstone T, Taylor AK, O'Donnell CA, Atherton H, Blane DN, et al. Finding the right GP: A qualitative study of the experiences of people with long- COVID. BJGP Open. 2020; 4(5): bjgpopen20X101143.

12. Fernández-de-Las-Peñas C. Long COVID: Current definition. Infection. 2022; 50(1): 285-286.

13. Soriano JB, Murthy S, Marshall JC, Relan P, Diaz JV. WHO Clinical Case Definition Working Group on Post-COVID-19 Condition. A clinical case definition of post-COVID-19 condition by a Delphi consensus. Lancet Infect Dis. 2022; 22(4): e102-e107.

14. Sivan M, Taylor S. NICE guideline on long covid. BMJ. 2020; 371: m4938.

15. Greenhalgh T, Knight M, A'Court C, Buxton M, Husain L. Management of post-acute covid-19 in primary care. BMJ. 2020; 370: m3026.

16. World Health Organization. A clinical case definition of post COVID 19 condition by a Delphi consensus. 2021. https://www.who.int/ publications/i/item/WHO -2019 -nCoV -Post_COVID -19_condition -Clinical_ case_definition -2021.1.

17. Arias-Reyes C, Zubieta-DeUrioste N, Poma-Machicao L, Aliaga-Raduan F, Carvajal-Rodriguez F, et al. Does the pathogenesis of SARS-CoV-2 virus decrease at high-altitude? Respir PhysiolNeurobiol. 2020; 277: 103443.

18. Ruggiero L, Harrison SWD, Rice CL, McNeil CJ. Neuromuscular fatigability at high altitude: Lowlanders with acute and chronic exposure, and native highlanders. Acta Physiol (Oxf). 2022; 234(4): e13788.

19. Boulware DR, Pullen MF, Bangdiwala AS, Pastick KA, Lofgren SM, et al. A Randomized Trial of Hydroxychloroquine as Postexposure Prophylaxis for Covid-19. N Engl J Med. 2020; 383(6): 517-525.

20. Pun M, Turner R, Strapazzon G, Brugger H, Swenson ER. Lower Incidence of COVID-19 at High Altitude: Facts and Confounders. High Alt Med Biol. 2020; 21(3): 217-222.

21. United-States-Environmental-Protection-Agency. Calculating the UV Index. 2017. https://wwwepagov/sunsafety/calculating-uv-index-0.

22. Arias-Reyes C, Zubieta-DeUrioste N, Poma-Machicao L, Aliaga-Raduan F, Carvajal-Rodriguez F, et al. High-altitude is associated with better short-term survival in critically ill COVID-19 patients admitted to the ICU. PLoS One. 2022; 17(3): e0262423.

23. Xi A, Zhuo M, Dai J, Ding Y, Ma X, et al. Epidemiological and clinical characteristics of discharged patients infected with SARS-CoV-2 on the Qinghai Plateau. J Med Virol. 2020; 92(11): 2528-2535. doi: 10.1002/jmv.26032.

24. Li JJ, Zhang HQ, Li PJ, Xin ZL, Xi AQ, et al. Case series of COVID-19 patients from the Qinghai-Tibetan Plateau Area in China. World J Clin Cases. 2021; 9(24): 7032-7042. doi: 10.12998/wjcc.v9.i24.7032.

25. Song P, Han H, Feng H, Hui Y, Zhou T, et al. High altitude Relieves transmission risks of COVID-19 through meteorological and environmental factors: Evidence from China. Environ Res. 2022; 212(Pt B): 113214.

26. Fulco CS, Lewis SF, Frykman PN, Boushel R, Smith S, et al. Muscle fatigue and exhaustion during dynamic leg exercise in normoxia and hypobaric hypoxia. J Appl Physiol. 1996; 81(5): 1891-900.

27. Xiong Q, Xu M, Li J, Liu Y, Zhang J, et al. Clinical sequelae of COVID-19 survivors in Wuhan, China: A single-centre longitudinal study. Clin Microbiol Infect. 2021; 27(1): 89-95.

28. Zhu H, Liu C, Qian H. Pharmaceutical Potential of High-Altitude Plants for Fatigue-Related Disorders: A Review. Plants (Basel). 2022; 11(15): 2004.

29. Cao C, Zhang H, Huang Y, Mao Y, Ma L, et al. The combined use of acetazolamide and Rhodiola in the prevention and treatment of altitude sickness. Ann Transl Med. 2022; 10(10): 541.

30. Luo C, Xu X, Wei X, Feng W, Huang H, et al. Natural medicines for the treatment of fatigue: Bioactive components, pharmacology, and mechanisms. Pharmacol Res. 2019; 148: 104409.

31. Khanum F, Bawa AS, Singh B. Rhodiola rosea: A Versatile Adaptogen. Compr Rev Food Sci Food Saf. 2005; 4(3): 55-62.

32. Khan A, Muhamad NA, Ismail H, Nasir A, Khalil AAK, et al. Potential Nutraceutical Benefits of in Vivo Grown Saffron (Crocus sativus L.) As Analgesic, Anti-inflammatory, Anticoagulant, and Antidepressant in Mice. Plants (Basel). 2020; 9(11): 1414.

33. Ni W, Gao T, Wang H, Du Y, Li J, et al. Anti-fatigue activity of polysaccharides from the fruits of four Tibetan plateau indigenous medicinal plants. J Ethnopharmacol. 2013; 150(2): 529-35.

34. Chen CY, Hou CW, Bernard JR, Chen CC, Hung TC, et al. Rhodiola crenulata- and Cordyceps sinensis-based supplement boosts aerobic exercise performance after short-term high altitude training. High Alt Med Biol. 2014; 15(3): 371-9.

35. Ma C, Hu L, Tao G, Lv W, Wang H. An UPLC-MS-based metabolomics investigation on the anti-fatigue effect of salidroside in mice. J Pharm Biomed Anal. 2015; 105: 84-90.

36. Xie X, He Z, Chen N, Tang Z, Wang Q, et al. The Roles of Environmental Factors in Regulation of Oxidative Stress in Plant. Biomed Res Int. 2019; 2019: 9732325.